Aeronautical Information Management Modernization S2 (AIMM S2)

Aeronautical Common Service (ACS) Data Service Web Service Requirements Document (WSRD)

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1.0	02/11/2015	Drew Hawley	First Official Release: Final Draft
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2.1	09/01/2015	Drew Hawley	Second Official Release: Final
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3.1	11/13/2015	Drew Hawley	Complete Draft for ACS Mapping (WMS) service
3.2	07/28/2016	Drew Hawley	Updated Draft per FAA comments from Release 2
3.3	09/01/2016	Saivilasini Neti	Updated Final per FAA comments for V3.2
3.4	4/10/2017	Parveen Groome	Updated Final

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

1 Scope

The Northrop Grumman Aeronautical Information Management Modernization Segment 2 (AIMM S2) Web Service Requirements Document (WSRD) was prepared in accordance with the Federal Aviation Administration (FAA) Standard FAA-STD-070. The document provides the interface requirements for the Aeronautical Information Management Modernization (AIMM) service and its Web Service Clients. It addresses all items necessary to achieve the mutual understanding, commitment, and performance of individuals and groups that MUST execute or support the WSRD. The WSRD is a dynamic document and will be updated on a periodic basis to reflect changes to the Web Services Requirements approach, changes to Northrop Grumman Information Systems (IS) policies and procedures, advances in methodologies, new tools, and process improvements employed by the AIMM S2 team.

1.1 Background

With the increasing amount of air traffic that is regulated by the FAA, there is also going to be an increase in the amount of information pertaining to said air traffic. The information that is produced from the air traffic is monitored by a breadth of unique interfaces. These interfaces ingest, filter, parse, and display data. Such interfaces as Notices to Airmen (NOTAMs) or Special Use Airspace (SUA) were created to handle this influx of metadata. Multiple interfaces that provide similar and/or the same Aeronautical Information (AI) led to data integrity, ingest, and cost-related problems.

AIMM S2 supports the FAA and Next Generation Air Transportation Systems (NextGen) objectives by establishing an automation process and providing information systems and services to address the current and future needs of air traffic, while providing aviation users with Aeronautical Information that conforms to international standards.

The ACS web services portion allows for FAA Internal machine to machine interaction over a network while abiding to a machine-processable format. The external FAA systems that will be interacting with the AIMM web services will comply to specifically determined operations in the form of Web Service Definition Language (WSDL) documents using Simple Object Access Protocols (SOAP), which are translated using Hyper Text Transfer Protocol (HTTP), and eXtensive Markup Language (XML) code that is in conjunction with existing Web Service Standards.

2 Applicable Documents

2.1 Government Documents

FAA SPECIFICATIONS:	
[1] FAA Acquisition System Toolset (FAST) Test and Evaluation Process Guidelines, January 2011,	FAA Acquisition System Toolset (FAST) Test and Evaluation Process Guidelines, January 2011, http://fast.faa.gov/docs/teguidelines.doc

System-Wide Information Management (SWIM) Service Specification Document (SvSD) December 22, 2009	System-Wide Information Management (SWIM) Service Specification Document (SvSD) Segment 1, version 1.7
SWIM Basic Security Profile 1.1	SWIM WS-I Basic Security Profile 1.1 http://www.ws-i.org/profiles/basicsecurityprofile-1.1.html
NIST Guide to Secure Web Services May 23, 2007	http://csrc.nist.gov/publications/nistpubs/800-95/SP800-95.pdf
NEMS Interface Control Document	NAS Enterprise Messaging Service (NEMS) Interface Control Document (ICD) Version 6, May 2015. Available upon request from SWIM Program Office.
NAS TV-1/2 Technical Standards Profile and Forecast	https://sep.faa.gov/architecture/enterprise/display/1/tab/As-Is?state=1?state=1?state=1?state=1
FAA STANDARDS:	
FAA-STD-063 May 1, 2009	Standard Practice, XML Namespaces
FAA-STD-064 May 1, 2009	Standard Practice, Web Service Registration
FAA-STD-065a February 26, 2010	Standard Practice, Preparation of Web Service Description Documents
FAA-STD-070 July 12, 2012	Standard Practice, Preparation of Web Service Requirements Documents
FAA-STD-066 February 26, 2010	Standard Practice, Web Service Taxonomies
FAA-STD-025f November 30, 2007	Preparation of Interface Documentation
STANDARDS FOR FAA SWIM PROGRAM COMPLIANCE:	
IETF RFC 7230 June 2014	Hypertext Transfer Protocol – HTTP/1.1 https://tools.ietf.org/html/rfc7230
IETF RFC 7231 June 2014	Hypertext Transfer Protocol (HTTP/1.1): Semantics and Content https://tools.ietf.org/html/rfc7231

IETF RFC 7232 June 2014	Hypertext Transfer Protocol (HTTP/1.1): Conditional Requests https://tools.ietf.org/html/rfc7232
IETF RFC 7233 June 2014	Hypertext Transfer Protocol (HTTP/1.1): Range Requests https://tools.ietf.org/html/rfc7233
IETF RFC 7234 June 2014	Hypertext Transfer Protocol (HTTP/1.1): Caching https://tools.ietf.org/html/rfc7234
IETF RFC 7235 June 2014	Hypertext Transfer Protocol (HTTP/1.1): Authentication https://tools.ietf.org/html/rfc7235
IETF RFC 7236 June 2014	Initial Hypertext Transfer Protocol (HTTP)Authentication Scheme Registrations https://tools.ietf.org/html/rfc7236
IETF RFC 7237 June 2014	Initial Hypertext Transfer Protocol (HTTP) Method Registrations https://tools.ietf.org/html/rfc7237
W3C SOAP v. 1.2, Pt. 1 Recommendation April 27, 2007	SOAP Version 1.2 Part 1: Messaging Framework (Second Edition) http://www.w3.org/TR/soap12-part1/
W3C XML Recommendation November 26, 2008	World Wide Web Consortium Extensible Markup Language (XML) version 1.0, fifth edition. http://www.w3.org/TR/REC-xml/
OASIS UDDI v. 3.0.2 October 19, 2004	Universal Description, Discovery, and Integration (UDDI) Standard, version 3.0.2 https://www.oasis-open.org/committees/uddi-spec/doc/tcspecs.htm
W3C WSDL v. 2.0 Note March 15, 2001	World Wide Web Consortium Web Services Description Language (WSDL) version 2.0 http://www.w3.org/TR/wsdl20-soap11-binding/
IETF RFC 2246 January 1999	Transport Layer Security (TLS) – version 1.0 https://www.ietf.org/rfc/rfc2246.txt

IETF INTERNET-DRAFT November 18, 1996	Internet Drafts of working documents from the IETF https://www.ietf.org/id-info/

OTHER FAA PUBLICATIONS:

March 9, 2014	System Wide Information Management (SWIM) Governance Policies, Version 2.0 https://www.faa.gov/nextgen/programs/swim/governance/standards/media/Governance-Policies-v20.html

2.2 Non-Government Standards and Other Publications

STANDARDS:

Aeronautical Information Exchange Model 5.1 Specification	The model used for defining SAAs used in the transmission to and from the AIMM S2 Service. http://www.aixm.aero/public/standard_page/download.html
Internet Engineering Task Force (IETF) Request for Comments (RFC) 791 September 1981	Internet Protocol (IP) as updated by RFC 1349 https://tools.ietf.org/html/rfc1349
IETF RFC 792 September 1, 1981	Internet Control Message Protocol (ICMP), updated by RFC 950 https://tools.ietf.org/html/rfc792
IETF RFC 793 September 1981	Transmission Control Protocol (TCP), updated by RFC 3168 https://tools.ietf.org/html/rfc793
IETF RFC 826 November 1, 1982	Ethernet Address Resolution Protocol (ARP) https://tools.ietf.org/html/rfc826
IETF RFC 6101 August, 2011	The Secure Sockets Layer (SSL) Internet Protocol Version 3.0 https://tools.ietf.org/html/rfc6101
IETF RFC 2460 December 1998	Internet Protocol, Version 6 (IPv6) Specification https://www.ietf.org/rfc/rfc2460.txt
OpenGIS Web Map Server Implementation Specification March 15, 2006	OpenGIS Web Map Server Implementation Specification, Version 1.3.0, Reference Document Number: OGC 06-042 http://www.opengeospatial.org/standards/wms

Styled Layer Descriptor profile of the Web Map Service Implementation Specification June 29, 2007	OGC Styled Layer Descriptor profile of the Web Map Service Implementation Specification Version 1.1.0 (revision 4), Reference Document Number: OGC 05-078r4 http://www.opengeospatial.org/standards/sld
Web Services Security UsernameToken Profile 1.1 February 1, 2006	Web Services Security UsernameToken Profile 1.1, OASIS Standard Specification http://docs.oasis-open.org/wss/v1.1/wss-v1.1-spec-os-UsernameTokenProfile.pdf
OTHER PUBLICATIONS:	
Red Hat JBoss A-MQ 6.2WS-Notification Guide, Version 6.2 Sept 22, 2015	Accessing Topic Subscriptions through the WS-Notification Standard https://access.redhat.com/documentation/en-US/Red_Hat_JBoss_A-MQ/6.2/html/WS-Notification_Guide/index.html

3 Definitions

3.1 Terms and Definitions

Term	Definition
Access Control	Protection of system resources against unauthorized access; a process by which use of system resources is regulated according to a security policy and is permitted by only authorized entities.
Audit	A process that records information needed to establish accountability for system events for the actions of system entities that cause them.
Audit Trail	A chronological record of system activities that is sufficient to enable the reconstruction and examination of the sequence of environments and activities.
Authentication	The process of verifying an identity claimed by or for a system entity.
Authorization	The granting of rights or permission to a system entity (mainly but not always a user or a group of users) to access a Web Service.
Aeronautical Information	All FAA related data that will be housed within the One Stop Shop.

Term	Definition
Binding	An association between an interface, a concrete protocol, and a data format. A binding specifies the protocol and data format to be used in transmitting messages defined by the associated interface.
Business Function	A characteristic action or activity that needs to be performed to achieve a desired objective, or in the context of this standard, to achieve a real world effect.
Confidentiality	Protective measures that assure that information is not made available or disclosed to unauthorized individuals, entities, or processes
Credentials	Data that is transferred to establish the claimed identity of an entity.
Data Element	A unit of data for which the definition, identification, representation, and permissible values are specified by means of a set of attributes.
Datatype	A computer representation of a well-known abstract concept such as integer or date.
Description	An account of the content of a resource.
Effect	A state or condition that results from interaction with a service. Multiple states may result depending on the extent to which the interaction completes successfully or generates a fault.
FAA Data Registry (FDR)	The official source of the FAA's data standards. The FDR (http://fdr.gov/fdr/Home.jsp) is a Web-enabled system that provides ready access to the agency's standards and is compliant with the International Organization for Standardization/International Electrotechnical Commission (ISO/IEC) Standard 11179, Information Technology – Metadata Registries (MDR), Parts 1 – 6 (http://metadata-standards.org/11179/).
FAA Telecommunications Infrastructure (FTI)	A network that supports National Airspace System (NAS) operations by providing the connectivity required by systems including the Enhanced Traffic Management Systems (ETMS), the Standard Terminal Automated Replacement System (STARS), and the Wide Area Augmentation System (WAAS), and

Term	Definition
	applications like e-mail, Internet, payroll, and other administrative services.
Fault	A message that is returned as a result of an error that prevents a service from implementing a required function. A fault usually contains information about the cause of the error.
Format	The arrangement of bits or characters within a group, such as a data element, message, or language.
Idempotent	A term used to describe an operation in which a given message will have the same effect whether it is received once or multiple times; i.e., receiving duplicates of a given message will not cause any undesirable effect.
Identifier (ID)	A sequence of characters, capable of uniquely identifying that with which it is associated, within a specified context.
Input	Data entered into, or the process of entering data into, information processing system or any of its parts for storage or processing. (Adapted from)
Integrity	Protective measures that assure that data has not been changed, destroyed, or lost in an unauthorized or accidental manner.
Interface	See Service Interface.
Internet	A large, heterogeneous collection of interconnected systems that can be used for communications of many different types between any interested parties connected to it. The term includes both the "core Internet" (Internet service provider networks) and "edge Internet" (corporate and private networks, often connected via firewalls, network address translation boxes, application layer gateways, and similar devices).
Message	An identifiable collection of units of information (data elements), presented in a manner suitable for communication, interpretation, or processing within a context of interacting SOA components.
Message Exchange Pattern (MEP)	A template, devoid of application semantics, that describes a generic pattern for the exchange of messages between agents. It

Term	Definition
	describes the relationships (e.g., temporal, causal, sequential, etc.) of multiple messages exchanged in conformance with the pattern, as well as the normal and abnormal termination of any message exchange conforming to the pattern.
Metadata	Data that defines or describes other data.
Name	The designation of an object by a linguistic expression.
Namespace	A collection of names, identified by a URI reference, that are used in XML documents as element types and attribute names. The use of XML namespaces to uniquely identify metadata terms allows those terms to be unambiguously used across applications, promoting the possibility of shared semantics.
Non-Repudiation	Protective measures against false denial of involvement in a communication.
Operation	A set of messages related to a single Web service action.
Organization	A unique framework of authority within which a person or persons act, or are designated to act, towards some purpose. Any department, service, or other entity within an organization which needs to be identified for information exchange.
Output	Data transferred out of, or the process by which an information processing system or any of its parts transfers data out of, that system or part. (Adapted from)
Permissible Values	The set of allowable instances of a data element.
Precondition	A state or condition that is required to be true before an action can be successfully invoked.
Processing	A set of algorithms, calculations, or business rules that operate on input data in order to produce the required output or to produce a change of internal state.
Protocol	A formal set of conventions governing the format and control of interaction among communicating functional units.
Quality of Service (QoS) Characteristic	A parameter that specifies and measures the value of a provided service.

Term	Definition
Real World Effect	An ultimate purpose associated with the interaction with a particular service. It may be the response to a request for information or the change in the state of some entities shared between the participants in the interaction.
Registry	An enabling infrastructure that uses a formal registration process to store, catalog, and manage metadata relevant to a service. A registry supports the search, identification, and understanding of resources, as well as query capabilities.
Resource	An object of information that is available on an Internet and identified by a unique Uniform Resource Identifier.
Role	A collection of permissions to use resources made available by a Web service.
Security	The protection of information and data so that unauthorized persons or systems cannot read or modify them and authorized persons or systems are not denied access to them.
Semantics	A conceptualization of the implied meaning of information that requires words and/or symbols within a usage context.
Service	See Web service
Service Category	One or more values selected from a hierarchical convention that is used to categorize all FAA services.
Service Consumer	An organization that seeks to satisfy a particular need through the use of capabilities offered by means of a service.
Service Criticality	A single value selected from a list of values that is used to categorize a service in terms of the significance given to a functional failure of that service.
Service Description	The information needed in order to use, or consider using, a service.
Service Interface	An abstract boundary that a Web service exposes. It defines the types of messages and the message exchange patterns that are involved in interacting with the Web service, together with any conditions implied by those messages.
Service Provider	An organization that offers the use of capabilities by means of a service.

Term	Definition
Service-Oriented Architecture (SOA)	A paradigm for organizing and utilizing distributed capabilities that may be under the control of different ownership domains. A SOA provides a uniform means to offer, discover, interact with, and use capabilities to produce desired effects consistent with measurable preconditions and expectations.
Software Agent	A running program that drives Web services, both to implement them and to access them.
Standard	A document established by consensus and approved by a recognized body, which provides, for common and repeated use, rules, guidelines, or characteristics for activities or their results, aimed at the achievement of the optimum degree of order in a given context. Note: standards SHALL be based on the consolidated results of science, technology, and experience, and aimed at the promotion of optimum community benefits.
Synchronous Operation	A type of operation whose message exchange pattern describes temporally coupled or "lock-step" interactions, e.g., remote procedure call (RPC)-style request-response interactions.
Token	A data object or a portable, user-controlled, physical device used to verify an identity in an authentication process.
Uniform Resource Identifier (URI)	A compact string of characters for identifying an abstract or physical resource.
Uniform Resource Locator (URL)	A type of URI that identifies a resource via a representation of its primary access mechanism (e.g., its network "location"), rather than by some other attributes it may have.
User	A human, his/her agent, a surrogate, or an entity that interacts with information processing systems. A person, organization entity, or automated process that accesses a system, whether authorized to do so or not.
Web Service	A platform-independent, loosely-coupled software component designed to support interoperable machine-to-machine interaction over a network. It has an interface described in a machine-processable format. Other systems interact with the Web service in a manner

Term	Definition
	prescribed by its description by means of XML-based messages conveyed using Internet transport protocols in conjunction with other Web-related standards.

3.2 Acronyms and Abbreviations

Table 3-1. Acronyms and Abbreviations

Acronym	Definition
AIM	Aeronautical Information Management
AIXM	Aeronautical Information Exchange Model
ANSI	American National Standards Institute
ATC	Air Traffic Control
ATS	Air Traffic Services
ESMG	FAA En Route Services Modernization Group
FAA	Federal Aviation Administration
FDR	Federal Data Registry
FIPS	Federal Information Processing Standards
FPS	Flight Plan Service
FPXM	Flight Plan Exchange Model
FSS	Flight Service Station
FTI	FAA Telecommunications Infrastructure
hPa	hectopascal
HTTP	Hypertext Transfer Protocol
HTTPS	Hypertext Transfer Protocol Secure
ICAO	International Civil Aviation Organization
ID	Identifier
IETF	Internet Engineering Task Force
IFR	Instrument Flight Rules
INCITS	InterNational Committee for Information Technology Standards
IRD	Interface Requirements Document
ISO/IEC	International Organization for Standardization/International Electrotechnical Commission
IT	Information Technology
Java EE	Oracle Java Platform, Enterprise Edition
JMS	Java Message Service
MDR	Metadata Registry
MEP	Message Exchange Pattern
MSL	Mean Sea Level
NAS	National Airspace System
NextGen	Next Generation Air Transportation System
NIST	National Institute of Standards and Technology
OASIS	Organization for the Advancement of Structured Information Standards
OGC	Open Geospatial Consortium

Acronym	Definition
P/CG	Pilot/Controller Glossary
PIN	Personal Identification Number
PNG	Portable Network Graphics
QoS	Quality of Service
RFC	Request for Comment
RPC	Remote Procedure Call
SEM	System Engineering Manual
SOA	Service Oriented Architecture
SOAP	Simple Object Access Protocol
TCP/IP	Transmission Control Protocol/Internet Protocol
TLS	Transport Layer Security
TMP	Traffic Modernization Program
URI	Uniform Resource Identifier
URL	Uniform Resource Locator
UTC	Coordinated Universal Time
VFR	Visual Flight Rules
RTM	Verification Requirements Traceability Matrix
W3C	World Wide Web Consortium
WMS	Web Map Service
WMTS	Web Map Tile Service
WS	Web Service
WSDD	Web Service Description Document
WSDL	Web Service Description Language
WSN	Web Services Notification
WSRD	Web Service Requirements Document
WSS	Web Service Security
XML	eXtensible Markup Language

4 Required Service Information

4.1 Service Characteristics

Table 4-1. ACS Service Characteristics

Name:	Aeronautical Common Services
Description:	The Aeronautical Common Service (ACS)) provides the ability for the FAA and NAS stakeholders to access aeronautical data (including NOTAMs, Special Activity Airspace (SAA), airport reference and configuration data, procedure data, and obstacle data) in multiple formats; permitting the ability of data service users to customize for themselves delivery and optimizing visual perception and data presentation in a manner that provides value to the consumer. In addition, the ACS will allow the FAA to promote more intelligent use of

Name:	Aeronautical Common Services
	the NAS by using analytics; thereby improving the operational efficiency of the NAS.
Namespace:	urn:us:gov:dot:faa:aim:acs
Revision:	1.0
Service Categories:	Agency Infrastructure Service, Agency Service, Air Transportation Information Service, Air Transportation Infrastructure Information Service, Air Transportation Infrastructure Service, Air Transportation Service, Aircraft Information Service, Aircraft Service.
Criticality Level:	Essential (urn:us:gov:dot:faa:taxonomies:service-critical)

4.2 Service Providers

The ACS service SHALL be provided by the AIM directorate. AIM is the authoritative source under FAA for collecting, validating, storing, maintaining, and disseminating aeronautical data concerning the United States and its territories to support real-time aviation activities.

Table 4-2. AIM as a Service Provider

Name:	Aeronautical Information Management
Description:	The ACS service is provided by AIM. The AIM group is the authoritative government source for collecting, validating, storing, maintaining, and disseminating Aeronuatical data concerning NAS resrouces in the United States and its territories to support real-time aviation activities.
Namespace:	urn:us:gov:dot:faa:aim:acs
Website	TBD

4.3 Service Consumers

The ACS service is available for all FAA consumers, which could include but not limited to FAA Internal Users, Department of Defense, Airlines, third party developers, and other consumers interested in the latest AI data issued by the FAA. The major consumers of the ACS for Release 2 will be the consumers of SAMS and NASR data who will be able to query SAMS and NASR data as well as be notified when specific data has been updated.

5 Functional Requirements

5.1 Service Business Function Requirements

5.1.1 Query/Web Services

[AIMMS2Req-507, SSD-581, I/T, R3] The system shall integrate Mission Support source data listed in Table 1 and Section F3.7. Mission support sources will provide AIXM compliant data. The system must provide this data to AIMM S2 consumers.

5.1.2 Spatial Information Mapping Service

[AIMMS2Req-285, SSD-315, T/I, R3] The system shall provide a mapping service for all geographical AI contained in the system.

Note: the WMS will provide images to include raster images of NAVAIDs, airspaces, and airport geometries.

[AIMMS2Req-849, AIMMS2Req-285, T, R3] The AI Service Engine shall provide map reference layers.

[AIMMS2Req-850, AIMMS2Req-285, T, R3] The AI Service Engine shall provide Magnetic Variation data.

[AIMMS2Req-851, AIMMS2Req-285, T, R3] The AI Service Engine shall provide sectional charts.

[AIMMS2Req-286, SSD-316, I, R3] The mapping service shall comply with the OGC WMS Implementation Specification.

[AIMMS2Req-287, SSD-317, I, R3] WMS layers shall be configured using the OGC SLD format, as defined in the Styled Layer Descriptor Profile of the Web Map Service Implementation Specification.

[AIMMS2Req-288, SSD-318, I/T, R3] The system shall provide styling of layers and features provided by the WMS using stored styling definitions.

[AIMMS2Req-289, SSD-319, I/T, R3] The system shall accept symbology encoding files, in order to automatically configure the display of AI.

[AIMMS2Req-2531, AIMMS2Req-289, I/T, R3] The symbology encoding files shall be provided as external graphics files that contain the shape and color information defining how to render a symbol.

[AIMMS2Req-290, SSD-320, I, R3] The styling options shall be provided in a catalog for users to be made aware of styling options.

[AIMMS2Req-291, SSD-321, I/T, R3] The system shall provide a mechanism for users to retrieve symbols and styles from the catalog/repository.

[AIMMS2Req-292, SSD-322, I/T, R3] The system shall provide a mechanism for users to download symbology files for use in external systems.

Note: FAA shall provide clarification regarding the desired mechanism for users to access symbology files.

Discover Data

[AIMMS2Req-293, SSD-325, I/T, R3] WMS shall advertise supported coordinate reference systems as part of the GetCapabilities response.

Filter Data

[AIMMS2Req-294, SSD-326, I/T, R3] The system shall synchronize WMS metadata changes among WMS instances.

[AIMMS2Req-295, SSD-328, I/T, R3] The system WMS shall filter data for a set of user-provided field names. (RangeSubset.) [OpenGIS Web Map Service Implementation Specification, version 1.3.0, Sections 7.2.4.2, 7.3.3.3]

[AIMMS2Req-296, SSD-329, I/T, R3] The system WMS shall filter data by the basic geometries in accordance with BoundingBox data structure, as specified in [OpenGIS Web Map Service Implementation Specification, version 1.3.0 Sections 7.3.3.5, 7.3.3.6].

[AIMMS2Req-297, SSD-330, I/ T, R3] The system WMS must filter data by a valid time and the most recently generated forecast when a product generation time is not specified. [OpenGIS Web Map Service Implementation Specification, version 1.3.0, Annex C]

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[AIMMS2Req-298, SSD-331, I/T, R3] The system WMS shall filter temporally aggregated datasets for trajectory-related geometries.

[AIMMS2Req-299, SSD-332, I/T, R3] The system WMS shall filter for data above a user-specified parameter value. (Filtered data returned is non-inclusive of the parameter value.)

[AIMMS2Req-300, SSD-333, I/T, R3] The system WMS shall filter for data below a user-specified parameter value. (Filtered data returned is non-inclusive of the parameter value.

[AIMMS2Req-301, SSD-334, I/T, R3] The system WMS shall filter for data equal to a user-specified parameter value.

[AIMMS2Req-302, SSD-335, I/T, R3] The system WMS shall filter for data between two user-specified parameter values. (Filtered data returned is non-inclusive of the two parameter values.)

[AIMMS2Req-303, SSD-336, I/T, R3] The system WMS Tiling capability shall filter data for a set of user-provided layer name [OpenGIS Web Map Tile Service Implementation Specification, version 1.0.0, Sections 7.2.2, 8.2]

[AIMMS2Req-304, SSD-337, I/T, R3] The system WMS tiling capability shall filter data by the TileMatrix in accordance to the structure as specified in [OpenGIS Web Map Tile Service Implementation Specification, version 1.0.0, Sections 7.2.2, 8.2]

[AIMMS2Req-305, SSD-338, I/T, R3] The system WMS tiling capability shall filter data by valid time and the most recently generated forecast when a product generation time is not specified in accordance to optional parameters as specified in [OpenGIS Web Map Tile Service Implementation Specification, version 1.0.0, Sections 7.1.1.1.2]

[AIMMS2Req-306, SSD-339, I/T, R3] The system WMS tiling capability shall filter data by elevation in accordance to optional parameters as specified in [OpenGIS Web Map Tile Service Implementation Specification, version 1.0.0, Sections 7.1.1.1.2]

Convert Data

[AIMMS2Req-307, SSD-341, I/T, R3] The system WMS shall convert the positions of data from spherical coordinates to NAD83 earth models/datum coordinates as needed. [OpenGIS Web Map Service Implementation Specification, version 1.3.0, Sections 7.3.3.5, 7.3.3.6, 7.3.5]

[AIMMS2Req-308, SSD-342, I/T, R3] The system WMS shall convert the positions of data from spherical coordinates to WGS84 earth models/datum coordinates as needed. [OpenGIS Web Map Service Implementation Specification, version 1.3.0, Sections 7.3.3.5, 7.3.3.6, 7.3.5]

[AIMMS2Req-309, SSD-343, I/T, R3] The system WMS shall convert the positions of data from NAD83 coordinates to spherical earth models/datum coordinates as needed. [OpenGIS Web Map Service Implementation Specification, version 1.3.0, Sections 7.3.3.5, 7.3.3.6, 7.3.5]

[AIMMS2Req-310, SSD-344, I/T, R3] The system WMS shall convert the positions of data from WGS84 coordinates to spherical earth models/datum coordinates as needed. [OpenGIS Web Map Service Implementation Specification, version 1.3.0, Sections 7.3.3.5, 7.3.3.6, 7.3.5]

[AIMMS2Req-311, SSD-345, I/T, R3] The system WMS shall convert the positions of data from NAD83 coordinates to WGS84 earth models/datum coordinates as needed. [OpenGIS Web Map Service Implementation Specification, version 1.3.0, Sections 7.3.3.5, 7.3.3.6, 7.3.5]

[AIMMS2Req-312, SSD-346, I/T, R3] The system WMS shall convert the positions of data from WGS84 coordinates to NAD83 earth models/datum coordinates as needed. [OpenGIS Web Map Service Implementation Specification, version 1.3.0, Sections 7.3.3.5, 7.3.3.6, 7.3.5]

[AIMMS2Req-313, SSD-347, I/T, R3] The system WMS shall convert flight level to feet above ground level, as needed.

> [AIMMS2Req-2516, AIMMS2Req-313, I/T, R3] A conversion app shall be developed on the WMS client side that converts flight level to feet above ground.

[AIMMS2Req-314, SSD-348, I/T, R3] The system WMS shall convert standard pressure to flight level as needed.

> [AIMMS2Req-1850, AIMMS2Req-314, I/T, R3] A conversion app shall be developed on the WMS client side that converts standard pressure to flight level.

[AIMMS2Req-315, SSD-349, I/T, R3] The system WMS shall convert standard pressure to feet above ground level as needed.

> [AIMMS2Req-1851, AIMMS2Req-315, I/T, R3] A conversion app shall be developed on the WMS client side that converts standard pressure to feet above ground level.

[AIMMS2Req-316, SSD-350, I/T, R3] The system WMS shall convert standard pressure to feet above mean sea level as needed.

> [AIMMS2Req-1852, AIMMS2Req-316, I/T, R3] A conversion app shall be developed on the WMS client side that converts standard pressure to feet above mean sea level.

[AIMMS2Req-317, SSD-351, I/T, R3] The system WMS shall convert units of direction between true north and magnetic north.

> [AIMMS2Req-1853, AIMMS2Req-317, I/T, R3] A conversion app shall be developed on the WMS client side that converts units of direction between true north and magnetic north.

[AIMMS2Req-318, SSD-352, I/T, R3] The system WMS shall convert flight level to feet above mean sea level, as needed.

> [AIMMS2Req-1854, AIMMS2Req-318, I/T, R3] A conversion app shall be developed on the WMS client side that converts flight level to feet above mean sea level.

[AIMMS2Req-319, SSD-353, I/T, R3] The system WMS shall convert meters above mean sea level to flight level, as needed.

> [AIMMS2Req-1855, AIMMS2Req-319, I/T, R3] A conversion app shall be developed on the WMS client side that converts meters above mean sea level to flight level.

[AIMMS2Req-320, SSD-354, T, R3] The system WMS shall convert meters above mean sea level to feet above ground level, as needed.

> [AIMMS2Req-1856, AIMMS2Req-320, T, R3] A conversion app shall be developed on the WMS client side that converts meters above sea level to feet above ground level.

[AIMMS2Req-321, SSD-355, T, R3] The system WMS shall convert meters above mean sea level to feet above mean sea level, as needed.

> [AIMMS2Req-1857, AIMMS2Req-321, T, R3] A conversion app shall be developed on the WMS client side that converts meters above sea level to feet above mean sea level.

[AIMMS2Req-322, SSD-356, T, R3] The system WMS shall convert feet above ground level to flight level, as needed.

> [AIMMS2Req-1858, AIMMS2Req-322, T, R3] A conversion app shall be developed on the WMS client side that converts feet above ground to flight level.

[AIMMS2Req-323, SSD-357, T, R3] The system WMS shall convert feet above ground level to feet above mean sea level, as needed.

> [AIMMS2Req-1859, AIMMS2Req-323, T, R3] A conversion app shall be developed on the WMS client side that converts feet above ground level to feet above mean sea level.

[AIMMS2Req-324, SSD-358, T, R3] The system WMS shall convert feet above mean sea level to flight level, as needed.

> [AIMMS2Req-1860, AIMMS2Req-324, T, R3] A conversion app shall be developed on the WMS client side that converts feet above mean sea level to flight level.

[AIMMS2Req-325, SSD-359, T, R3] The system WMS shall convert feet above mean sea level to feet above ground level, as needed.

[AIMMS2Req-1861, AIMMS2Req-325, T, R3] A conversion app shall be developed on the WMS client side that converts feet above mean sea level to feet above ground level.

Re-project Data

[AIMMS2Req-326, SSD-361, I/T, R3] The system WMS shall advertise supported coordinate reference systems as part of the GetCapabilities response.

[AIMMS2Req-327, SSD-362, I/T, R3] The system WMS shall re-project the positions of data from parameterized coordinates for radar products coordinates to parameterized Cartesian coordinates upon request.

[AIMMS2Req-2532, AIMMS2Req-327, I/T, R3] A WMS server generalized capability (e.g. plugin) shall be developed to convert parameterized radar coordinates to parameterized Cartesian spherical (latitude, longitude) coordinates.

[AIMMS2Req-328, SSD-363, I/T, R3] The system WMS shall re-project the positions of data from parameterized coordinates for radar products coordinates to parameterized Lambert Azimuthal Equal-Area map projection coordinates upon request.

[AIMMS2Req-2533, AIMMS2Req-328, I/T, R3] The parameterized radar coordinates for radar products shall be converted to parameterized Cartesian spherical coordinates as per Requirement AIMMS2Req-327, Decomposition 1.

[AIMMS2Req-2534, AIMMS2Req-328, I/T, R3] The parameterized Cartesian spherical coordinates for radar products shall be re-projected to parameterized Lambert Azimuthal Equal-Area map projection coordinates upon request.

[AIMMS2Req-329, SSD-364, I/T, R3] The system WMS shall re-project the positions of data from parameterized coordinates for radar products coordinates to parameterized Latitude/Longitude map projection coordinates upon request.

[AIMMS2Req-2535, AIMMS2Req-329, I/T, R3] The parameterized radar coordinates for radar products shall be converted to parameterized Cartesian spherical coordinates as per Requirement AIMMS2Req-327, Decomposition 1.

[AIMMS2Req-2536, AIMMS2Req-329, I/T, R3] The parameterized Cartesian spherical coordinates for radar products shall be re-projected to parameterized Latitude/Longitude map projection coordinates upon request.

[AIMMS2Req-330, SSD-365, I/T, R3] The system WMS shall re-project the positions of data from parameterized coordinates for radar products coordinates to parameterized Mercator map projection coordinates upon request.

[AIMMS2Req-2537, AIMMS2Req-330, I/T, R3] The parameterized radar coordinates for radar products shall be converted to parameterized Cartesian spherical coordinates as per Requirement AIMMS2Req-327, Decomposition 1.

[AIMMS2Req-2538, AIMMS2Req-330, I/T, R3] The parameterized Cartesian spherical coordinates for radar products shall be re-projected to parameterized Mercator map projection coordinates upon request.

[AIMMS2Req-331, SSD-366, I/T, R3] The system WMS shall re-project the positions of data from parameterized coordinates for radar products to parameterized En Route NAS Projection map projection coordinates upon request.

[AIMMS2Req-2539, AIMMS2Req-331, I/T, R3] FAA shall provide a definition for the parameterized En Route NAS (National Airspace System) projection.

[AIMMS2Req-2540, AIMMS2Req-331, I/T, R3] The parameterized radar coordinates for radar products shall be converted to parameterized Cartesian spherical coordinates as per Requirement AIMMS2Req-327, Decomposition 1.

[AIMMS2Req-2541, AIMMS2Req-331, I/T, R3] The parameterized Cartesian spherical coordinates for radar products shall be re-projected to parameterized En Route NAS projection coordinates upon request.

[AIMMS2Req-332, SSD-367, I/T, R3] The system WMS shall re-project the positions of data from parameterized coordinates for radar products to parameterized Oceanic NAS Projection map projection coordinates upon request.

[AIMMS2Req-2542, AIMMS2Req-332, I/T, R3] FAA shall provide a definition for the Oceanic NAS (National Airspace System) parameterized projection.

[AIMMS2Req-2543, AIMMS2Req-332, I/T, R3] The parameterized radar coordinates for radar products shall be converted to parameterized Cartesian spherical coordinates as per Requirement AIMMS2Req-327, Decomposition 1.

[AIMMS2Req-2544, AIMMS2Req-332, I/T, R3] The parameterized Cartesian spherical coordinates for radar products shall be re-projected to parameterized Oceanic NAS projection coordinates upon request.

[AIMMS2Req-333, SSD-368, I/T, R3] The system WMS shall re-project the positions of data from parameterized coordinates for radar products to parameterized Stereographic (including polar) map projection upon request.

[AIMMS2Req-2545, AIMMS2Req-333, I/T, R3] The parameterized radar coordinates for radar products shall be converted to parameterized Cartesian spherical coordinates as per Requirement AIMMS2 Req-327, Decomposition 1.

[AIMMS2Req-2546, AIMMS2Req-333, I/T, R3] The parameterized Cartesian spherical coordinates for radar products shall be re-projected to parameterized Stereographic (including polar) map projection coordinates upon request.

[AIMMS2Req-334, SSD-369, I/T, R3] The system WMS shall re-project the positions of data from parameterized Lambert Conformal coordinates to parameterized Cartesian coordinates upon request.

[AIMMS2Req-335, SSD-370, I/T, R3] The system WMS shall re-project the positions of data from parameterized Lambert Conformal coordinates to parameterized Latitude/Longitude map projection coordinates upon request.

[AIMMS2Req-336, SSD-371, I/T, R3] The system WMS shall re-project the positions of data from parameterized Lambert Conformal coordinates to parameterized Mercator map projection coordinates upon request.

[AIMMS2Req-337, SSD-372, I/T, R3] The system WMS shall re-project the positions of data from parameterized Lambert Conformal coordinates to parameterized En Route NAS Projection map projection coordinates upon request.

[AIMMS2Req-338, SSD-373, I/T, R3] The system WMS shall re-project the positions of data from parameterized Lambert Conformal coordinates to parameterized Oceanic NAS Projection map projection coordinates upon request.

[AIMMS2Req-339, SSD-374, I/T, R3] The system WMS shall re-project the positions of data from parameterized Lambert Conformal map projection coordinates to parameterized Lambert Azimuthal Equal-Area map projection coordinates upon request.

[AIMMS2Req-340, SSD-375, I/T, R3] The system WMS shall re-project the positions of data from parameterized Latitude/Longitude coordinates to parameterized Cartesian coordinates upon request.

[AIMMS2Req-341, SSD-376, I/T, R3] The system WMS shall re-project the positions of data from parameterized Latitude/Longitude coordinates to parameterized Lambert Azimuthal Equal-Area map projection coordinates upon request.

[AIMMS2Req-342, SSD-377, I/T, R3] The system WMS shall re-project the positions of data from parameterized Latitude/Longitude coordinates to parameterized Mercator map projection coordinates upon request.

[AIMMS2Req-343, SSD-378, I/T, R3] The system WMS shall re-project the positions of data from parameterized Latitude/Longitude coordinates to parameterized NAS Projection map projection coordinates upon request.

[AIMMS2Req-344, SSD-379, I/T, R3] The system WMS shall re-project the positions of data from parameterized Mercator coordinates to parameterized Lambert Azimuthal Equal-Area map projection coordinates upon request.

[AIMMS2Req-345, SSD-380, I/T, R3] The system WMS shall re-project the positions of data from parameterized Mercator coordinates to parameterized Latitude/Longitude map projection coordinates upon request.

[AIMMS2Req-346, SSD-381, I/T, R3] The system WMS shall re-project the positions of data from parameterized Mercator coordinates to parameterized En Route NAS Projection map projection coordinates upon request.

[AIMMS2Req-347, SSD-382, I/T, R3] The system WMS shall re-project the positions of data from parameterized Mercator coordinates to parameterized Oceanic NAS Projection map projection coordinates upon request.

[AIMMS2Req-348, SSD-383, I/T, R3] The system WMS shall re-project the positions of data from parameterized NAS Projection coordinates to parameterized Cartesian coordinates upon request.

[AIMMS2Req-349, SSD-384, I/T, R3] The system WMS shall re-project the positions of data from parameterized NAS Projection coordinates to parameterized Latitude/Longitude map projection coordinates upon request.

[AIMMS2Req-350, SSD-385, I/T, R3] The system WMS shall re-project the positions of data from parameterized En Route NAS Projection coordinates to parameterized Mercator map projection coordinates upon request.

[AIMMS2Req-351, SSD-386, I/T, R3] The system WMS shall re-project the positions of data from parameterized Oceanic NAS Projection coordinates to parameterized Mercator map projection coordinates upon request.

[AIMMS2Req-352, SSD-387, I/T, R3] The system WMS shall re-project the positions of data from parameterized Stereographic (including polar) coordinates to parameterized Cartesian coordinates upon request.

[AIMMS2Req-353, SSD-388, T, R3] The system WMS shall re-project the positions of data from parameterized Stereographic (including polar) coordinates to parameterized Lambert Azimuthal Equal-Area map projection coordinates upon request.

[AIMMS2Req-354, SSD-389, T, R3] The system WMS shall re-project the positions of data from parameterized Stereographic (including polar) coordinates to parameterized Latitude/Longitude map projection coordinates upon request.

[AIMMS2Req-355, SSD-390, I/T, R3] The system WMS shall re-project the positions of data from parameterized Stereographic (including polar) coordinates to parameterized Mercator map projection coordinates upon request.

[AIMMS2Req-356, SSD-391, I/T, R3] The system WMS shall re-project the positions of data from parameterized Stereographic (including polar) coordinates to parameterized En Route NAS Projection map projection coordinates upon request.

[AIMMS2Req-357, SSD-392, I/T, R3] The system WMS shall re-project the positions of data from parameterized Stereographic (including polar) coordinates to parameterized Oceanic NAS Projection map projection coordinates upon request.

[AIMMS2Req-358, SSD-393, I/T, R3] The system WMS shall use defined coordinate reference systems for re-projection transformations. [OpenGIS Web Map Service Implementation Specification, version 1.3.0, Sections 7.3.3.5, 7.3.3.6, 7.3.5]

[AIMMS2Req-359, SSD-394, I/T, R3] The system WMS shall re-project a different parameterization of the Lambert Azimuthal Equal-Area map projection upon request.

[AIMMS2Req-360, SSD-395, I/T, R3] The system WMS shall re-project a different parameterization of the Lambert Conformal map projection upon request. [Web Coverage Service (WCS) Implementation Standard, version 1.1.2, Section 10.3.4]

[AIMMS2Req-361, SSD-396, I/T, R3] The system WMS shall re-project a different parameterization of the Mercator map projection upon request.

[AIMMS2Req-362, SSD-397, I/T, R3] The system WMS shall re-project a different parameterization of the En Route NAS Projection map projection upon request.

[AIMMS2Req-363, SSD-398, I/T, R3] The system WMS shall re-project a different parameterization of the Oceanic NAS Projection map projection upon request.

[AIMMS2Req-364, SSD-399, I/T, R3] The system WMS shall re-project a different parameterization of Stereographic (including polar) coordinates upon request.

[AIMMS2Req-365, SSD-400, I/T, R3] The system WMS shall re-project a different parameterization of radar product coordinates upon request.

[AIMMS2Req-366, SSD-401, I/T, R3] The system WMS shall re-project a different parameterization of Cartesian coordinates upon request.

[AIMMS2Req-367, SSD-402, I/T, R3] The system WMS shall re-project a different parameterization of Latitude/Longitude coordinates upon request.

[AIMMS2Req-368, SSD-403, I/T, R3] The system WMS shall re-project a different parameterization of the En Route NAS Projection Tile Matrix up request in accordance to [OpenGIS Web Map Tile Service Implementation Specification, version 1.0.0, Sections 6.1, 7.1.1.1.2]

[AIMMS2Req-369, SSD-404, I/T, R3] The system WMS shall re-project a different parameterization of the Oceanic NAS Projection Tile Matrix up request in accordance to [OpenGIS Web Map Tile Service Implementation Specification, version 1.0.0, Sections 6.1, 7.1.1.1.2]

[AIMMS2Req-370, SSD-405, I/T, R3] The system WMS shall re-project a different parameterization of the Stereographic (including Polar) Tile Matrix up request in accordance to [OpenGIS Web Map Tile Service Implementation Specification, version 1.0.0, Sections 6.1, 7.1.1.1.2]

[AIMMS2Req-371, SSD-406, I/T, R3] The system WMS shall re-project a different parameterization of the radar product Tile Matrix up request in accordance to [OpenGIS Web Map Tile Service Implementation Specification, version 1.0.0, Sections 6.1, 7.1.1.1.2]

[AIMMS2Req-372, SSD-407, I/T, R3] The system WMS shall re-project a different parameterization of the Cartesian Tile Matrix up request in accordance to [OpenGIS Web Map Tile Service Implementation Specification, version 1.0.0, Sections 6.1, 7.1.1.1.2]

[AIMMS2Req-373, SSD-408, I/T, R3] The system WMS shall re-project a different parameterization of the Latitude/Longitude Tile Matrix up request in accordance to [OpenGIS Web Map Tile Service Implementation Specification, version 1.0.0, Sections 6.1, 7.1.1.1.2]

Decrease Geo Res

[AIMMS2Req-374, SSD-410, I/T, R3] The system WMS shall change the geographic resolution of gridded data products in accordance with a user-specified resolution upon request. [OpenGIS Web Map Service Implementation Specification, version 1.3.0, Sections 7.3.3.5, 7.3.3.6, 7.3.5]

[AIMMS2Req-375, SSD-411, I/T, R3] The system WMS shall use "nearest neighbor" as the default method of spatial interpolation. [OpenGIS Web Map Service Implementation Specification, version 1.3.0, Annex C.4.3]

[AIMMS2Req-376, SSD-412, I/T, R3] The system WMS tiling capability shall dynamically offer products as a collection of tile matrices in accordance to [OpenGIS Web Map Tile Service Implementation Specification, version 1.0.0, Sections 6.1, 7.1.1.1.2]

Process Data

[AIMMS2Req-377, SSD-414, I, R3] The system WMS shall read data stored in JPEG as a native dataset format.

[AIMMS2Req-3341, AIMMS2Req-377, T, R3] The WMS shall provide files stored in JPEG format.

[AIMMS2Req-378, SSD-415, I, R3] The system WMS shall read data stored in GIF as a native dataset format.

[AIMMS2Req-2554, AIMMS2Req-378, T, R3] The WMS shall provide files stored in GIF format.

[AIMMS2Req-379, SSD-416, I, R3] The system WMS shall read data stored in PNG as a native dataset format.

[AIMMS2Req-3342, AIMMS2Req-379, T, R3] The WMS shall provide files stored in PNG format.

[AIMMS2Req-380, SSD-417, I/T, R3] The system WMS shall apply different styles to dataset upon request.

[AIMMS2Req-381, SSD-418, I/T, R3] The system WMS tiling capability shall offer products as a collection of dynamic tile matrices in accordance to [OpenGIS Web Map Tile Service Implementation Specification, version 1.0.0, Sections 6.1, 7.1.1.1.2]

[AIMMS2Req-382, SSD-419, I/T, R3] The system WMS shall store image data in the WMS common data store. (When proxying data from NOAA, the WMS shall have the ability to retrieve data from another WMS and store those files for local access.)

[AIMMS2Req-383, SSD-420, I/T, R3] The system WMS shall accept user-specified Section parameters for GetCapabilities requests.

Standards Compliance

[AIMMS2Req-390, SSD-429, I/T, R3] The system WMS shall execute the mandatory functionality of the [OpenGIS Web Map Tile Service Specification, version 1.0.0]

5.1.3 Data Analytics

Airspace Conflict Identification

[AIMMS2Req-249, SSD-275, T, R3] The system shall provide a service that detects geometrical and temporal overlaps between a user-specified airspace and all other airspaces.

Note: a potential use case is that the user submits an airspace UUID and times of use (or a SUA schedule, which contains an airspace reference and times of use). The service returns either a "no conflict" or the UUIDs of airspaces that overlap both in time and space.

Geodetic Computation

[AIMMS2Req-256, SSD-284, T, R3] The system shall provide a geodetic computation web service that replicates the Inverse and Forward functions which are available at http://www.ngs.noaa.gov/TOOLS/Inv_Fwd/Inv_Fwd.html.

[AIMMS2Req-257, SSD-285, T, R3] The system shall provide a web service that provides the magnetic declination of a specific point on the earth, for a given date relying on NOAAs web system for lookup data. (http://www.ngdc.noaa.gov/geomag/models.shtml).

Post-Operational Metrics

[AIMMS2Req-250, SSD-277, T, R3] The system shall calculate new AI (metrics) using algorithms that operate on existing AI.

Note: An example metric could be SAA utilization vs. SAA Time of Use.

[AIMMS2Req-251, SSD-278, T, R3] The system shall provide a web service for users to create metrics definitions.

[AIMMS2Req-252, SSD-279, T, R3] The system shall provide a web service to store metrics definitions.

[AIMMS2Req-253, SSD-280, T, R3] The system shall provide a web service to query metrics definitions.

[AIMMS2Req-254, SSD-281, T, R3] The system shall provide a web service to query metrics analysis results.

[AIMMS2Req-255, SSD-282, T, R3] The system shall provide a GUI to view metrics analysis results from a predetermined set of metrics definitions.

5.1.4 ACS WFS Services

[AIMMS2Req-259, SSD-289, T, R2] The system shall provide a mechanism for users to query aeronautical features based on any combination of 2-dimension (D), 2.5D, and 3D spatial, temporal, and attribute constraints.

[AIMMS2Req-2589, AIMMS2Req-259, T, R2] The AI Service Engine shall allow the query of aeronautical features within a bounding box.

[AIMMS2Req-2590, AIMMS2Req-259, T, R2] The AI Service Engine shall allow a query of aeronautical features within a radius of a center point

[AIMMS2Req-2591, AIMMS2Req-259, T, R2] The AI Service Engine shall allow a query of aeronautical features within an ARTCC boundary

[AIMMS2Req-2592, AIMMS2Req-259, T, R2] The AI Service Engine shall allow a query of aeronautical features within a specified distance of a segment.

[AIMMS2Req-2593, AIMMS2Req-259, T, R2] The AI Service Engine shall allow a query of airspaces active within a specified time period.

[AIMMS2Req-2678, AIMMS2Req-259, T, R2] The AI Service Engine shall allow the query of aeronautical features based on data elements, at a minimum of, UUID, AirspaceVolume, DESIGNATOR, PROPERTYNAME, NOTE, saaType, legalDefinitionType, NAME, TYPE, MILITARY, SUA Type and Altitude.

[AIMMS2Req-3382, AIMMS2Req-259, T, R3] The AI Service Engine shall allow the query of aeronautical features, at a minimum of, airport, Runway and route (flight trajectory).

[AIMMS2Req-872, AIMMS2Req-259, T, R2] The AI Service Engine shall provide a web service that enables the query of aeronautical features.

[AIMMS2Req-873, AIMMS2Req-259, T, R2] The AI Service Engine shall provide a web service that enables the management of queries of aeronautical features.

[AIMMS2Req-268, SSD-298, T, R2] The system shall provide a mechanism for users to query for all elements that are associated with a user-selected feature (e.g. show all NAVAIDs associated, through an AIXM reference, with a runway).

Note: In other words if the AIXM definition of feature A has an AIXM link to feature B, but the converse is not true, a query for features associated with feature B must still return feature A in addition to any other associated features.

[AIMMS2Req-260, SSD-290, T, R2] The system shall provide a mechanism for a user to request a description of each aeronautical feature provided by the system.

Note: AIMMS2Req-459 provides a data dictionary that defines aeronautical features.

[AIMMS2Req-261, SSD-291, T, R2] The system shall provide a mechanism for a user to receive a description of each aeronautical feature provided by the system.

Note: OSS provides users access to an aeronautical data dictionary.

[AIMMS2Req-263, SSD-293, T, R2] The system shall provide a web service for users to create customized queries.

[AIMMS2Req-835, AIMMS2Req-263, T, R2] The AI Service Engine shall provide the ability to define names for customized queries.

[AIMMS2Req-836, AIMMS2Req-835, T, R2] The AI Service Engine shall allow each user to create unique names for the customized queries.

[AIMMS2Req-837, AIMMS2Req-263, T, R2] The AI Service Engine shall provide the ability to access a list of a user's customized queries.

[AIMMS2Req-265, AIMMS2Req-263, T, R2] The AI Service Engine shall provide a web service for users to modify customized queries.

[AIMMS2Req-264, SSD-294, T, R2] The system shall provide a web service for users to read customized queries.

[AIMMS2Req-838, AIMMS2Req-264, T, R2] The AI Service Engine shall provide the ability to access the customized queries through a saved name.

[AIMMS2Req-1659, SSD-295, T, R2] The system shall provide a web service for users to delete customized queries.

[AIMMS2Req-266, SSD-296, T, R2] The system shall provide a web service to query metadata.

[AIMMS2Req-269, SSD-299, T, R2] The system shall provide a WFS that provides geo-referenced information of features.

[AIMMS2Req-270, SSD-300, T, R2] The system shall provide AI via WFS.

[AIMMS2Req-2595, AIMMS2Req-270, T, R2] The AI Service Engine shall provide WFS via getCapabilities web service.

[AIMMS2Req-2596, AIMMS2Req-270, T, R2] The AI Service Engine shall provide WFS via describeFeatureType web service.

[AIMMS2Req-2598, AIMMS2Req-270, T, R2] The AI Service Engine shall provide WFS via getFeature web service.

[AIMMS2Req-2602, AIMMS2Req-270, T, R2] The AI Service Engine shall provide WFS via listStoredQueries web service.

[AIMMS2Req-2603, AIMMS2Req-270, T, R2] The AI Service Engine shall provide WFS via describeStoredQueries web service.

[AIMMS2Req-2604, AIMMS2Req-270, T, R2] The AI Service Engine shall provide WFS via createStoredQuery web service.

[AIMMS2Req-2605, AIMMS2Req-270, T, R2] The AI Service Engine shall provide a dropStoredQuery web servicethrough the WFS.

[AIMMS2Req-272, SSD-724, T, R2] AIMM S2 shall retrieve AI to fulfill queries.

Note: The sources of this data are defined in other sections.

5.1.5 ACS Data Query Services

[AIMMS2Req-874, AIMMS2Req-259, T, R2] The AI Service web service shall allow the query of dynamic SAA data.

[AIMMS2Req-875, AIMMS2Req-259, T, R2] The AI Service Engine web service shall allow the query of static SAA data.

[AIMMS2Req-271, SSD-723, I, R2] Historic data shall be accessed in such a manner to allow a user or process to completely reconstruct the entire change history of any given feature in the system, from inception to temporary alterations, to the current state.

Note: This requirement is dependent on the interactions with the authoritative sources providing the data.

[AIMMS2Req-272, SSD-724, T, R2] AIMM S2 shall retrieve AI to fulfill queries.

[AIMMS2Req-196, SSD-219, D, R2] The system shall provide integrated AI.

[AIMMS2Req-3719, AIMMS2Req-196, D, R3] The ACSDataQuery service shall provide capability for radial search given a point location (Airport ID, NAVAID ID) to provide integrated AI data.

[AIMMS2Req-3720, AIMMS2Req-196, D, R3] The ACSDataQuery service shall provide capability for searching along a flight path given a list of point locations (Airport ID, NAVAID ID, Airway ID, and FIX ID) to provide integrated AI data.

[AIMMS2Req-3479, AIMMS2Req-259, T, R3] The ACSDataQuery Service shall provide GetAIWithinRadius operation

[AIMMS2Req-3480, AIMMS2Req-3479, T, R3] The GetAIWithinRadius operation shall require the user to specify the radius

[AIMMS2Req-3481, AIMMS2Req-3479, T, R3] The GetAIWithinRadius operation shall allow the user to specify an Airport Location Identifier as the center point

[AIMMS2Req-3482, AIMMS2Req-3479, T, R3] The GetAIWithinRadius operation shall allow the user to specify a NAVAID Identifier as the center point

[AIMMS2Req-3483, AIMMS2Req-3479, T, R3] The GetAIWithinRadius operation shall allow the user to specify a FIX Identifier as the center point

[AIMMS2Req-3759, AIMMS2Req-3479, T, R3] The GetAIWithinRadius operation shall require the user to specify an AI feature group.

[AIMMS2Req-3760, AIMMS2Req-3479, T, R3] The GetAIWithinRadius operation shall provide Airports, NAVAIDs, Airspaces, Obstacles, ASOS/AWOS, and ARTCCs feature groups as input options.

[AIMMS2Req-3484, AIMMS2Req-3479, T, R3] The GetAIWithinRadius operation shall return the top level features that match the query criteria, for Airspace, RadioComunnicationChannel, Unit, VerticalStructure, Navaid, AirportHeliport, and Event the selected feature group.

[AIMMS2Req-3485, AIMMS2Req-259, T, R3] The ACSDataQuery Service shall provide GetAIAlongFlightPath operation

[AIMMS2Req-3486, AIMMS2Req-3485, T, R3] The GetAIAlongFlightPath operation shall require the user to specify a minimum altitude

[AIMMS2Req-3487, AIMMS2Req-3485, T, R3] The GetAIAlongFlightPath operation shall require the user to specify a maximum altitude

[AIMMS2Req-3488, AIMMS2Req-3485, T, R3] The GetAIAlongFlightPath operation shall require the user to specify a start date and time

[AIMMS2Req-3489, AIMMS2Req-3485, T, R3] The GetAIAlongFlightPath operation shall require the user to specify an end date and time

[AIMMS2Req-3490, AIMMS2Req-3485, T, R3] The GetAIAlongFlightPath operation shall require the user to specify multiple points on the flight trajectory

[AIMMS2Req-3491, AIMMS2Req-3485, T, R3] The GetAIAlongFlightPath operation shall require the user to specify an Airport Location Identifier as a point on the flight trajectory

[AIMMS2Req-3492, AIMMS2Req-3485, T, R3] The GetAIAlongFlightPath operation shall require the user to specify an NAVAID Identifier as a point on the flight trajectory

[AIMMS2Req-3493, AIMMS2Req-3485, T, R3] The GetAIAlongFlightPath operation shall require the user to specify an Airway Identifier as a point on the flight trajectory

[AIMMS2Req-3494, AIMMS2Req-3485, T, R3] The GetAIAlongFlightPath operation shall require the user to specify an FIX Identifier as a point on the flight trajectory

[AIMMS2Req-3761, AIMMS2Req-3485, T, R3] The GetAIAlongFlightPath operation shall require the user to specify a buffer distance

[AIMMS2Req-3762, AIMMS2Req-3485, T, R3] The GetAIAlongFlightPath operation shall require the user to specify an AI Feature Group

[AIMMS2Req-3763, AIMMS2Req-3485, T, R3] The GetAIAlongFlightPath operation shall provide Airports, NAVAIDs, Airspaces, Obstacles, ASOS/AWOS, and ARTCCs feature groups as input options.

[AIMMS2Req-3495, AIMMS2Req-3485, T, R3] The GetAIAlongFlightPath operation shall return the top level features that match the query criteria, for Airspace, RadioComunnicationChannel, Unit, VerticalStructure, Navaid, AirportHeliport, and Event the selected feature group.

[AIMMS2Req-3496, AIMMS2Req-259, T, R3] The ACSDataQuery Service shall provide GetChartDataForCycle operation

[AIMMS2Req-3497, AIMMS2Req-3496, T, R3] The GetChartDataForCycle operation shall require the user to specify the date for the chart cycle

[AIMMS2Req-3498, AIMMS2Req-3497, T, R3] The GetChartDataForCycle operation shall use the user specified date for the chart cycle to determine the chart cycle.

[AIMMS2Req-3499, AIMMS2Req-3496, T, R3] The GetChartDataForCycle operation shall the require the user to specify an AI feature

[AIMMS2Req-3500, AIMMS2Req-3496, T, R3] The GetChartDataForNextCycle operation shall return all AIXM timeslices (BASELINE and TEMPDELTA) for the selected AI feature for the requested chart cycle

[AIMMS2Req-3784, AIMMS2Req-259, T, R3] The ACSDataQuery Service shall provide GetNotamEventData operation

[AIMMS2Req-3485, AIMMS2Req-3484, T, R3] The GetNotamEventData operation shall require the user to specify the event identifier

[AIMMS2Req-3486, AIMMS2Req-3484, T, R3] The GetNotamEventData operation shall provide AI data that match the query criteria, for the NOTAM feature group.

5.1.6 ACS Data Subscription Services

[AIMMS2Req-258, SSD-287, T, R2] The system shall prompt users to resubmit requests that did not reach the server when the failure occurred.

> [AIMMS2Req-831, AIMMS2Req-258, T, R2] Failed requests shall contain descriptive information, in human readable format providing details about the failed request. Error information includes error codes, descriptive error text and time stamps.

[AIMMS2Req-262, SSD-292, T, R2] The system shall retrieve AI to fulfill AI subscriptions.

> [AIMMS2Req-3383, AIMMS2Req-262, D, R2] The Service Engine shall retrieve data from the ODS on notification of a change in AI data to fulfill the subscription.

[AIMMS2Req-273, SSD-302, T, R2] The system shall provide a web service to subscribe to AI updates.

Note: The mechanism for the following requirements is through a web service. The requirements for this service are documented in further detail in the Web Service Requirements Document (WSRD).

[AIMMS2Req-276, SSD-305, T, R2] The system shall provide AI subscriptions based on individual AI elements.

[AIMMS2Req-277, SSD-306, T, R2] The system shall provide a mechanism for users to subscribe to a user-selected subset of AI. Examples of filters are spatial, temporal, information type (e.g. SAA, airport obstruction).

[AIMMS2Req-278, SSD-307, T, R2] The system shall provide a mechanism for users to change their subscription parameters as desired.

[AIMMS2Req-279, SSD-308, T, R2] The system shall provide a mechanism for a user to set the end date/time for the subscription.

[AIMMS2Req-280, SSD-309, T, R2] The system shall provide a mechanism for a user to cancel a subscription.

[AIMMS2Req-281, SSD-310, I, R2] The system shall identify the sequence of subscription messages.

[AIMMS2Req-282, SSD-725, I, R2] The system shall record the sequence of subscription messages.

[AIMMS2Req-283, SSD-311, T, R2] The system shall ensure that messages are delivered once and only once to the subscriber.

[AIMMS2Req-284, SSD-312, T, R2] The system shall deliver AI subscriptions using the system-to-system web service for digital AI distribution.

[AIMMS2Req-274, SSD-303, T, R2] The system shall provide a mechanism for users to get information about the subscription service including metadata about the service and the capabilities of the service.

[AIMMS2Req-275, SSD-304, T, R2] The system shall provide a mechanism for authorized users to configure the times for notification dissemination when a notification time is not enforced by the system.

5.2 Service Interface Requirements

ACS SHALL provide the following interfaces and operations:

Table 5-1. ACS Interfaces

Interface	Description	Operations
ACSWMTS	ACSWMTS or Web Map Tile Service allows the service consumer to view a map and aeronautical imagery that can be used to display maps of NAVAIDs, airspaces, and airports.	• getCapabilities • getTile • getFeatureInfo
ACSWMS	ACSWMS or Web Map Service allows the service consumer to view a map and aeronautical imagery that can be used to display maps of NAVAIDs, airspaces, and airports.	• getCapabilities • getMap • getFeatureInfo • getLegendGraphic
ACSWFS	ACSWFS allows a service consumer to submit queries and returns aeronautical	• getFeature • getCapabilities • describeFeatureType • getPropertyValue

Interface	Description	Operations
	features that match the query. In addition the getFeature and getPropertyValue operations can utilize stored query to retrieve AI. ACS does not support operations that allow the user to modify AI data. When these operations are requested, ACS will throw a ServiceExceptionReportException. A fault "profiled out" will be displayed in the response message.	• listStoredQueries • describeStoredQueries • createStoredQuery • dropStoredQuery ACSWFS will not support the following operations: • getFeatureWithLock • lockFeature • Transaction
ACSPostOpMetrics	Service for defining and requesting results of metrics that operate on existing Aeronautical Information. A consumer can define metrics and store them for later use. A consumer can run a metric definition and retrieve the results in a format that is chosen by the consumer.	• createMetricDefinition • listMetricDefintions • modifyMetricDefinition • getMetricDefintion • getMetricResults • deleteMetricDefinition • listPreDefinedMetrics Definitions
ACSGeodeticComputation	ACSGeodeticComputation allows the service to compute geodetic components and to compute magnetic field component.	• computeInverse • computeInverse3D • computeForward • computeForward3D • computeBearingBearing • computeSegmentSegment

Interface	Description	Operations
		• computeSegmentDistance • computePointSegment • computeMagneticDeclination
ACSAirspaceDeconfliction	ACSAirspaceDeconfliction allows a service consumer to evaluate a specified airspace and schedule conflicts spatially and temporally with other airspace schedules.	• isAirspaceConflict
ACSDataSubscription	Web Service Notification Service (WSN) that allows users to create and manage subscription to topics in order to receive notification of updates to AI. This service also allows users to create and manages PullPoints, where notification messages accumulate and can be retrieved at requested intervals. ACS will support retrieval of up to a maximum 200 messages at a time. Consuming systems should take the above limit into consideration when retrieving messages from their pullpoints.	• subscribe • renew • unsubscribe • createPullPoint • getPullPointMessages • destroyPullPoint • getResourceProperty
ACSDataQuery	ACSDataQuery allows a service consumer to submit	• getSaaDefinitionByUuid • getSaaScheduledByU

Interface	Description	Operations
	pre-defined complex queries and returns aeronautical features that match the query.	uid • getIntegratedSaaByUuid • getAIAlongFlightPath • getAIWithinRadius • getAIForNotamEvent • getChartDataForCycle
ACSAirspaceConflictDetection	ACSAirspaceConflictDetection allows the service to detect airspace conflicts between the incoming data and features in the database.	• getAirspaceConflict • getAirspaceConflictByUUID

5.2.1 Operations

1. ACS SHALL perform the operations as specified in the section below.

Messages to be exchanged during execution of the operations are specified in section 5.1.2 of the WSRD. Faults to be generated as a result of operation failure are specified in section 5.1.2 of the WSRD.

Operations Belonging to Spatial Information Mapping

Table 5-2. ACSWMTS getCapabilites Operation

Operation Name	getCapabilities
Description	The getCapabilities operation is a discovery operation that retrieves the service metadata document for ACSWMTS. The document contains information about the layers that can be requested, and the tile sets in which these layers are available
MEP	In-Out
Operation Type	Synchronous
Operation Effect	Idempotent
Precondition	Only authorized users SHOULD be allowed to use ACSWMTS Service
Input	GetCapabilitiesRequest
Output	GetCapabilitiesResponse
Effect	Upon success, the system will retrieve the capabilities information.
Faults	ACSWMTS shall respond with errors/exceptions for unsuccessful operation.

Table 5-3. ACSWMTS getTile Operation

Operation Name	getTile
Description	The getTile operation returns a particular tile of a particular tile matrix set in a predefined format. It shows a fragment of a map representation of a layer.
MEP	In-Out
Operation Type	Synchronous
Operation Effect	Idempotent
Precondition	Only authorized users SHOULD be allowed to use ACSWMTS Service
Input	GetTileRequest
Output	GetTileResponse
Effect	Upon success, the system will an image of the requested tile layer
Faults	ACSWMTS shall respond with errors/exceptions for unsuccessful operation.

Table 5-4. ACSWMTS getFeatureInfo Operation

Operation Name	getFeatureInfo
Description	The getFeatutreInfo operation return information about a feature present at a particular pixel location on a map tile. Requests for feature information will specify the tile along with a pixel location on that tile.
MEP	In-Out
Operation Type	Synchronous
Operation Effect	Idempotent
Precondition	Only authorized users SHOULD be allowed to use ACSWMTS Service
Input	GetFeatureInfoRequest
Output	GetFeatureInfoResponse
Effect	Upon success, the system will return the schema location where definition of feature types are listed in the request.
Faults	ACSWMTS shall respond with errors/exceptions for unsuccessful operation.

Table 5-5. ACSWMS getCapabilites Operation

Operation Name	getCapabilities
Description	The getCapabilities operation generates a service metadata document describing the WMS service provided by a server
MEP	In-Out
Operation Type	Synchronous
Operation Effect	Idempotent
Precondition	Only authorized users SHOULD be allowed to use ACSWMS Service
Input	GetCapabilitiesRequest
Output	GetCapabilitiesResponse

Effect	Upon success, the system will retrieve the capabilities information.
Faults	ACSWMS shall respond with errors/exceptions for unsuccessful operation.

Table 5-6. ACSWMS getMap Operation

Operation Name	getMap
Description	The getMap operation allows the user to retrieve map image
MEP	In-Out
Operation Type	Synchronous
Operation Effect	Idempotent
Precondition	Only authorized users SHOULD be allowed to use ACSWMS Service
Input	GetMapRequest
Output	GetMaoResponse
Effect	Upon success, the system will return a picture of the layer specified in the format specified
Faults	ACSWMS shall respond with errors/exceptions for unsuccessful operation.

Table 5-7. ACSWMS getFeatureInfo Operation

Operation Name	getFeatureInfo
Description	The getFeatureInfo operation provides more information about features in the pictures of maps that were returned by previous getMap requests. User selects a specific point on the map for which to obtain more information
MEP	In-Out
Operation Type	Synchronous
Operation Effect	Idempotent
Precondition	Only authorized users SHOULD be allowed to use ACSWMS Service
Input	GetFeatureInfoRequest
Output	GetFeatureInfoResponse
Effect	Upon success, the system will return the schema location where definition of feature types are listed in the request.
Faults	ACSWMS shall respond with errors/exceptions for unsuccessful operation.

Table 5-8. ACSWMS getLegendGraphic Operation

Operation Name	getLegendGraphic
Description	The getLegendGraphic operation allows the user to retrieve a map legend graphic
MEP	In-Out
Operation Type	Synchronous

Operation Effect	Idempotent
Precondition	Only authorized users SHOULD be allowed to use ACSWMS Service
Input	GetLegendGraphicRequest
Output	GetLegendGraphicResponse
Effect	Upon success, the system will return a picture of the legend graphics in the format specified
Faults	ACSWMS shall respond with errors/exceptions for unsuccessful operation.

Table 5-9 ACSWMS describeLayer Operation

Operation Name	describeLayer
Description	The describeLayer operation allows the user to retrieve information for specified layer(s)
MEP	In-Out
Operation Type	Synchronous
Operation Effect	Idempotent
Precondition	Only authorized users SHOULD be allowed to use ACSWMS Service
Input	DescribeLayerRequest
Output	DescribeLayerResponse
Effect	Upon success, the system will return an XML document describing the specified layers
Faults	ACSWMS shall respond with errors/exceptions for unsuccessful operation.

Table 5-10. ACSWFS getFeature Operation

Operation Name	getFeature
Description	An operation that allows the user to retrieve AIXM Features. In addition the stored query can be used to retrieve AI.
MEP	In-Out
Operation Type	Synchronous
Operation Effect	Idempotent
Precondition	Only authorized users SHOULD be allowed to use ACS Data Service
Input	GetFeatureRequest
Output	GetFeatureResponse
Effect	Upon success, the system will retrieve the Features information.
Faults	ACS Data Service shall respond with errors/exceptions for unsuccessful operation.

Table 5-11. ACSWFS getCapabilities Operation

Operation Name	getCapabilities
Description	The getCapabilities operation generates a service metadata document describing the WFS service provided

	by a server
MEP	In-Out
Operation Type	Synchronous
Operation Effect	Idempotent
Precondition	Only authorized users SHOULD be allowed to use ACS Data Service
Input	GetCapabilitiesRequest
Output	GetCapabilitiesResponse
Effect	Upon success, the system will retrieve the capabilities information.
Faults	ACS Data Service shall respond with errors/exceptions for unsuccessful operation.

Table 5-12. ACSWFS describeFeatureType Operation

Operation Name	describeFeatureType
Description	The describeFeatureType operation returns a schema location of feature types offered by a WFS instance
MEP	In-Out
Operation Type	Synchronous
Operation Effect	Idempotent
Precondition	Only authorized users SHOULD be allowed to use ACS Data Service
Input	DescribeFeatureTypeRequest
Output	DescribeFeatureTypeResponse
Effect	Upon success, the system will return the schema location where definition of feature types are listed in the request.
Faults	ACS Data Service shall respond with errors/exceptions for unsuccessful operation.

Table 5-13. ACSWFS getPropertyValue Operation

Operation Name	getPropertyValue
Description	The getPropertyValue operation allows the value of a feature property or part of the value of a complex feature property to be retrieved from the data store for a set of features identified using a query expression. In addition the stored query can be used to retrieve AI.
MEP	In-Out
Operation Type	Synchronous
Operation Effect	Idempotent
Precondition	Only authorized users SHOULD be allowed to use ACS Data Service
Input	GetPropertyValueRequest
Output	GetPropertyValueResponse
Effect	Upon success, the system will return the definition of feature types listed in the request.
Faults	ACS Data Service shall respond with errors/exceptions for unsuccessful operation.

Table 5-14. ACSWFS listStoredQueries Operation

Operation Name	listStoredQueries
Description	The listStoredQueries operation lists the stored queries available on a server
MEP	In-Out
Operation Type	Synchronous
Operation Effect	Idempotent
Precondition	Only authorized users SHOULD be allowed to use ACS Data Service
Input	ListStoredQueriesRequest
Output	LlistStoredQueriesResponse
Effect	Upon success, the system will return the list of stored queries on the system
Faults	ACS Data Service shall respond with errors/exceptions for unsuccessful operation.

Table 5-15. ACSWFS describeStoredQueries Operation

Operation Name	describeStoredQueries
Description	The describeStoredQueries operation provides detailed meta data for each stored query requested
MEP	In-Out
Operation Type	Synchronous
Operation Effect	Idempotent
Precondition	Only authorized users SHOULD be allowed to use ACS Data Service
Input	DescribeStoredQueriesRequest
Output	DescribeStoredQueriesResponse
Effect	Upon success, the system will return the meta data associated with the requested stored queries
Faults	ACS Data Service shall respond with errors/exceptions for unsuccessful operation.

Table 5-16. ACSWFS createStoredQuery Operation

Operation Name	createStoredQuery
Description	The createStoredQuery operation creates a stored query on a server
MEP	In-Out
Operation Type	Synchronous
Operation Effect	Idempotent
Precondition	Only authorized users SHOULD be allowed to use ACS Data Service
Input	CreateStoredQueryRequest
Output	CreateStoredQueryResponse
Effect	Upon success, the system will create a new stored query
Faults	ACS Data Service shall respond with errors/exceptions for unsuccessful operation.

Table 5-17. ACSWFS dropStoredQuery Operation

Operation Name	dropStoredQuery
Description	The dropStoredQuery operation allows a previously created stored query to be dropped from the system
MEP	In-Out
Operation Type	Synchronous
Operation Effect	Idempotent
Precondition	Only authorized users SHOULD be allowed to use ACS Data Service
Input	DropStoredQueryRequest
Output	DropStoredQueryResponse
Effect	Upon success, the system will drop the stored query
Faults	ACS Data Service shall respond with errors/exceptions for unsuccessful operation.

Operations Belonging to Data Analytics

Table 5-18. ACSPostOpMetrics createMetricDefinition Operation

Operation Name	createMetricsDefinition
Description	The createMetricDefinition operation creates a metrics report in the repository.
MEP	In-Out
Operation Type	Synchronous
Operation Effect	Idempotent
Precondition	Only authorized users SHOULD be allowed to use ACSPostOpMetrics Service
Input	CreateMetricDefinitionRequest
Output	None
Effect	Upon success, the system will store the user supplied metrics report in the reports repository.
Faults	ACSPostOpMetrics shall respond with errors/exceptions for unsuccessful operation.

Table 5-19. ACSPostOpMetrics listMetricDefinitions Operation

Operation Name	listMetricsDefinitions
Description	The listMetricsDefinitions operation returns the list of metrics that are available to run.
MEP	In-Out
Operation Type	Synchronous
Operation Effect	Idempotent
Precondition	Only authorized users SHOULD be allowed to use ACSPostOpMetrics Service
Input	ListMetricDefinitionsRequest
Output	ListMetricDefinitionsResponse
Effect	Upon success, the system will retrieve the list of metric

	names and their types (predetermined or user) to the user.
Faults	ACSPostOpMetrics shall respond with errors/exceptions for unsuccessful operation.

Table 5-20. ACSPostOpMetrics modifyMetricDefinition Operation

Operation Name	modifyMetricDefinition
Description	The modifyMetricDefinition operation modifies an existing metrics report in the repository.
MEP	In-Out
Operation Type	Synchronous
Operation Effect	Idempotent
Precondition	Only authorized users SHOULD be allowed to use ACSPostOpMetrics Service
Input	ModifyMetricDefinitionRequest
Output	None
Effect	Upon success, the system will store the user supplied metrics report in the reports repository.
Faults	ACSPostOpMetrics shall respond with errors/exceptions for unsuccessful operation.

Table 5-21. ACSPostOpMetrics getMetricDefinition Operation

Operation Name	getMetricDefinition
Description	The getMetricDefintion operation returns the metric definition report source.
MEP	In-Out
Operation Type	Synchronous
Operation Effect	Idempotent
Precondition	Only authorized users SHOULD be allowed to use ACSPostOpMetrics Service
Input	GetMetricDefinitionRequest
Output	GetMetricDefinitionResponse
Effect	Upon success, the system will return the metrics report source.
Faults	ACSPostOpMetrics shall respond with errors/exceptions for unsuccessful operation.

Table 5-22. ACSPostOpMetrics getMetricResults Operation

Operation Name	getMetricResults
Description	The getMetricResults operation returns the result in the requested format of the metric report.
MEP	In-Out
Operation Type	Synchronous
Operation Effect	Idempotent
Precondition	Only authorized users SHOULD be allowed to use ACSPostOpMetrics Service
Input	GetMetricResultsRequest

Output	GetMetricResultsResponse
Effect	Upon success, the system will return the result of the metrics report in the requested format.
Faults	ACSPostOpMetrics shall respond with errors/exceptions for unsuccessful operation.

Table 5-23. ACSPostOpMetrics deleteMetricDefintion Operation

Operation Name	deleteMetricDefinition
Description	The deleteMetricDefintion operation allows the user to delete a user specified metrics definition report.
MEP	In-Out
Operation Type	Synchronous
Operation Effect	Idempotent
Precondition	Only authorized users SHOULD be allowed to use ACSPostOpMetrics Service
Input	DeleteMetricDefinitionRequest
Output	None
Effect	Upon success, the system will delete the named metric definition from the repository and responds to the user with an indication of success.
Faults	ACSPostOpMetrics shall respond with errors/exceptions for unsuccessful operation.

Table 5-24. ACSPostOpMetrics listPreDefinedMetricDefinitions Operation

Operation Name	listPreDefinedMetricDefinitions
Description	The listPreDefinedMetricDefinitions operation returns the list of default metrics that are available to run.
MEP	In-Out
Operation Type	Synchronous
Operation Effect	Idempotent
Precondition	Only authorized users SHOULD be allowed to use ACSPostOpMetrics Service
Input	ListPreDefinedMetricDefinitionsRequest
Output	ListPreDefinedMetricDefinitionsResponse
Effect	Upon success, the system will retrieve the list of default metric names and required parameters to the user.
Faults	ACSPostOpMetrics shall respond with errors/exceptions for unsuccessful operation.

Table 5-25. ACSGeodeticComputation computeInverse Operation

Operation Name	computeInverse
Description	The computeInverse operation computes the magnetic bearings, azimuths & approximate distance between two points
MEP	In-Out
Operation Type	Synchronous

Operation Effect	Idempotent
Precondition	Only authorized users SHOULD be allowed to use ACSGeodeticComputation Service
Input	ComputeInverseRequest
Output	ComputeInverseResponse
Effect	Upon success, the system will return the inverse information.
Faults	ACSGeodeticComputation shall respond with errors/exceptions for unsuccessful operation.

Table 5-26. ACSGeodeticComputation computeInverse3D Operation

Operation Name	computeInverse3D
Description	The computeInverse3D operation computes the segment between two points at different elevations.
MEP	In-Out
Operation Type	Synchronous
Operation Effect	Idempotent
Precondition	Only authorized users SHOULD be allowed to use ACSGeodeticComputation Service
Input	ComputeInverse3DRequest
Output	ComputeInverse3DResponse
Effect	Upon success, the system will return the inverse 3D information.
Faults	ACSGeodeticComputation shall respond with errors/exceptions for unsuccessful operation.

Table 5-27. ACSGeodeticComputation computeForward Operation

Operation Name	computeForward
Description	The computeForward operation computes one point of latitude and longitude
MEP	In-Out
Operation Type	Synchronous
Operation Effect	Idempotent
Precondition	Only authorized users SHOULD be allowed to use ACSGeodeticComputation Service
Input	ComputeForwardRequest
Output	ComputeForwardResponse
Effect	Upon success, the system will return the forward information.
Faults	ACSGeodeticComputation shall respond with errors/exceptions for unsuccessful operation.

Table 5-28. ACSGeodeticComputation computeForward3D Operation

Operation Name	computeForward3D
Description	The computeForward3D operation computes the second rising or descending point of a segment

MEP	In-Out
Operation Type	Synchronous
Operation Effect	Idempotent
Precondition	Only authorized users SHOULD be allowed to use ACSGeodeticComputation Service
Input	ComputeForward3DRequest
Output	ComputeForward3DResponse
Effect	Upon success, the system will return the forward 3D information.
Faults	ACSGeodeticComputation shall respond with errors/exceptions for unsuccessful operation.

Table 5-29. ACSGeodeticComputation computeBearingBearing Operation

Operation Name	computeBearingBearing
Description	The computeBearingBearing operation computes the intersecting point of two crossing segments
MEP	In-Out
Operation Type	Synchronous
Operation Effect	Idempotent
Precondition	Only authorized users SHOULD be allowed to use ACSGeodeticComputation Service
Input	ComputeBearingBearingRequest
Output	ComputeBearingBearingResponse
Effect	Upon success, the system will return the bearing bearing information.
Faults	ACSGeodeticComputation shall respond with errors/exceptions for unsuccessful operation.

Table 5-30. ACSGeodeticComputation computeSegmentSegment Operation

Operation Name	computeSegmentSegment
Description	The computeSegmentSegment operation computes intersecting point of two segments
MEP	In-Out
Operation Type	Synchronous
Operation Effect	Idempotent
Precondition	Only authorized users SHOULD be allowed to use ACSGeodeticComputation Service
Input	ComputeSegmentSegmentRequest
Output	ComputeSegmentSegmentResponse
Effect	Upon success, the system will return the segment segment information.
Faults	ACSGeodeticComputation shall respond with errors/exceptions for unsuccessful operation.

Table 5-31. ACSGeodeticComputation computeSegmentDistance Operation

Operation Name	computeSegmentDistance
Description	The computeSegmentDistance operation computes a point

	on the selected segment
MEP	In-Out
Operation Type	Synchronous
Operation Effect	Idempotent
Precondition	Only authorized users SHOULD be allowed to use ACSGeodeticComputation Service
Input	ComputeSegmentDistanceRequest
Output	ComputeSegmentDistanceResponse
Effect	Upon success, the system will return the segment distance information.
Faults	ACSGeodeticComputation shall respond with errors/exceptions for unsuccessful operation.

Table 5-32 ACSGeodeticComputation computePointSegment Operation

Operation Name	computePointSegment
Description	The computePointSegment operation computes distance of a third point from the selected segment
MEP	In-Out
Operation Type	Synchronous
Operation Effect	Idempotent
Precondition	Only authorized users SHOULD be allowed to use ACSGeodeticComputation Service
Input	ComputePointSegmentRequest
Output	ComputePointSegmentResponse
Effect	Upon success, the system will return the point segment information.
Faults	ACSGeodeticComputation shall respond with errors/exceptions for unsuccessful operation.

Table 5-33. ACSGeodeticComputation computeMagneticDeclination Operation

Operation Name	computeMagneticDeclination
Description	The computeMagneticDeclination operation computes the angle on the horizontal plane between the magnetic north and the true north at a particular location
MEP	In-Out
Operation Type	Synchronous
Operation Effect	Idempotent
Precondition	Only authorized users SHOULD be allowed to use ACSGeodeticComputation Service
Input	ComputeMagneticDeclinationRequest
Output	ComputeMagneticDeclinationResponse
Effect	Upon success, the system will return the magnetic declination information.
Faults	ACSGeodeticComputation shall respond with errors/exceptions for unsuccessful operation.

Table 5-34. ACSDataSubscription subscribe Operation

Operation Name	subscribe
Description	An operation that allows the user to subscribe to AI data flows.
MEP	In-Out
Operation Type	Synchronous
Operation Effect	Idempotent
Precondition	Only authorized users SHOULD be allowed to use ACS Data Service
Input	SubscribeRequest
Output	SubscribeResponse
Effect	Upon success, the system will create a subscription request.
Faults	ACS Data Service shall respond with errors/exceptions for unsuccessful operation.

Table 5-35. ACSDataSubscription renew Operation

Operation Name	renew
Description	An operation that allows the user renew their subscription to AI data flows.
MEP	In-Out
Operation Type	Synchronous
Operation Effect	Idempotent
Precondition	Only authorized users SHOULD be allowed to use ACS Data Service
Input	RenewRequest
Output	RenewResponse
Effect	Upon success, the system will update a subscription.
Faults	ACS Data Service shall respond with errors/exceptions for unsuccessful operation.

Table 5-36. ACSDataSubscription unsubscribe Operation

Operation Name	unsubscribe
Description	An operation that allows the user to delete their subscription to AI data flows.
MEP	In-Out
Operation Type	Synchronous
Operation Effect	Idempotent
Precondition	Only authorized users SHOULD be allowed to use ACS Data Service
Input	UnsubscribeRequest
Output	UnsubscribeResponse
Effect	Upon success, the system will delete a subscription.
Faults	ACS Data Service shall respond with errors/exceptions for unsuccessful operation.

Table 5-37. ACSDataSubscription createPullPoint Operation

Operation Name	createPullPoint
Description	An operation that allows the user to create a PullPoint to accumulate AI notification messages
MEP	In-Out
Operation Type	Synchronous
Operation Effect	Idempotent
Precondition	Only authorized users SHOULD be allowed to use ACS Data Service
Input	CreatePullPointRequest
Output	CreatePullPointResponse
Effect	Upon success, the system will display a subscription.
Faults	ACS Data Service shall respond with errors/exceptions for unsuccessful operation.

Table 5-38. ACSDataSubscription getPullPointMessages Operation

Operation Name	getPullPointMessages
Description	An operation that allows the user retrieve messages that have accumulated on the PullPoint resource.
MEP	In-Out
Operation Type	Synchronous
Operation Effect	Idempotent
Precondition	Only authorized users SHOULD be allowed to use ACS Data Service
Input	GetMessagesRequest
Output	GetMessagesResponse
Effect	Upon success, the system will display a subscription.
Faults	ACS Data Service shall respond with errors/exceptions for unsuccessful operation.

Table 5-39. ACSDataSubscription destroyPullPoint Operation

Operation Name	destroyPullPoint
Description	An operation that allows the user to destroy a PullPoint resource
MEP	In-Out
Operation Type	Synchronous
Operation Effect	Idempotent
Precondition	Only authorized users SHOULD be allowed to use ACS Data Service
Input	DestroyPullPointRequest
Output	DestroyPullPointResponse
Effect	Upon success, the system will display a subscription.

Faults	ACS Data Service shall respond with errors/exceptions for unsuccessful operation.

Table 5-40. ACSDataSubscription getResourceProperty Operation

Operation Name	getResourceProperty
Description	An operation that allows the user to retrieve the resource property
MEP	In-Out
Operation Type	Synchronous
Operation Effect	Idempotent
Precondition	Only authorized users SHOULD be allowed to use ACS Data Service
Input	getResourcePropertyRequest
Output	getResourcePropertyResponse
Effect	Upon success, the system will display a value for a resource.
Faults	ACS Data Service shall respond with errors/exceptions for unsuccessful operation.

Table 5-41. ACSDataQuery getSaaDefinitionByUuid Operation

Operation Name	getSaaDefinitionByUuid
Description	The getSaaDefinitionByUuid operation allows a consumer to query the static repository of non-WFS AI.
MEP	In-Out
Operation Type	Synchronous
Operation Effect	Idempotent
Precondition	Only authorized users SHOULD be allowed to use ACS Data Service
Input	GetSAADefinitionByUUIDRequest
Output	GetSAADefinitionByUUIDResponse
Effect	Upon success, the system will return the non-WFS SAA query
Faults	ACS Data Service shall respond with errors/exceptions for unsuccessful operation.

Table 5-42. ACSDataQuery getSaaScheduleByUuid Operation

Operation Name	getSaaScheduleByUuid
Description	The getSaaScheduleByUuid operation allows a consumer to query the dynamic SAMS/SUA AI.
MEP	In-Out
Operation Type	Synchronous
Operation Effect	Idempotent
Precondition	Only authorized users SHOULD be allowed to use ACS Data Service
Input	GetSAAScheduleByUUIDRequest
Output	GetSAAScheduleByUUIDResponse

Effect	Upon success, the system will return the requested SUA schedule query.
Faults	ACS Data Service shall respond with errors/exceptions for unsuccessful operation.

Table 5-43. ACSDataQuery getIntegratedSaaByUuid Operation

Operation Name	getIntegratedSaaByUuid
Description	The getIntegratedSaaByUuid operation allows a consumer to query the static and dynamic SAMS/SUA AI.
MEP	In-Out
Operation Type	Synchronous
Operation Effect	Idempotent
Precondition	Only authorized users SHOULD be allowed to use ACS Data Service
Input	GetIntegratedSAAByUUIDRequest
Output	GetIntegratedSAAByUUIDResponse
Effect	Upon success, the system will return the requested SUA definition and schedule query.
Faults	ACS Data Service shall respond with errors/exceptions for unsuccessful operation.

Table 5-44. ACSDataQuery getAIAlongFlightPath Operation

Operation Name	getAIAlongFlightPath
Description	The getAIAlongFlightPath operation allows a consumer to identify AI features along a given flight path.
MEP	In-Out
Operation Type	Synchronous
Operation Effect	Idempotent
Precondition	Only authorized users SHOULD be allowed to use ACS Data Service
Input	GetAIAlongFlightPathRequest
Output	GetAIAlongFlightPathResponse
Effect	Upon success, the system will return AIXM feature data which are found along flight path conforming to AIXM 5.1 format.
Faults	ACS Data Service shall respond with errors/exceptions for unsuccessful operation.

Table 5-45. ACSDataQuery getAIWithinRadius Operation

Operation Name	getAIWithinRadius
Description	The getAIWithinRadius operation allows a consumer to identify AI features within a radius for a given point and radius length.
MEP	In-Out
Operation Type	Synchronous
Operation Effect	Idempotent
Precondition	Only authorized users SHOULD be allowed to use ACS

	Data Service
Input	GetAIWithinRadiusRequest
Output	GetAIWithinRadiusResponse
Effect	Upon success, the system will return AI features which meats the query criteria conforming to AIXM 5.1 format.
Faults	ACS Data Service shall respond with errors/exceptions for unsuccessful operation.

Table 5-46. ACSDataQuery getAIForNotamEvent Operation

Operation Name	getAIForNotamEvent
Description	The getAIForNotamEvent operation allows a consumer to query NOTAMS given an Event identifier number.
MEP	In-Out
Operation Type	Synchronous
Operation Effect	Idempotent
Precondition	Only authorized users SHOULD be allowed to use ACS Data Service
Input	GetAIForNotamEventRequest
Output	GetAIForNotamEventResponse
Effect	Upon success, the system will return all NOTAMS stored in AIMM repository by the given event identifier number conforming to AIXM 5.1 format.
Faults	ACS Data Service shall respond with errors/exceptions for unsuccessful operation.

Table 5-47. ACSDataQuery getChartDataForCycle Operation

Operation Name	getChartDataForCycle
Description	The getChartDataForCycle operation allows a consumer to query AI data for a chart cycle.
MEP	In-Out
Operation Type	Synchronous
Operation Effect	Idempotent
Precondition	Only authorized users SHOULD be allowed to use ACS Data Service
Input	GetChartDataForCycleRequest
Output	GetChartDataForCycleResponse
Effect	Upon success, the system will return AI feature data for the identified chart cycle conforming to AIXM 5.1 format.
Faults	ACS Data Service shall respond with errors/exceptions for unsuccessful operation.

Table 5-48. ACSAirspaceConflictDetection getAirspaceConflict Operation

Operation Name	getAirspaceConflict
Description	The getAirspaceConflict operation detects an airspace conflict between the incoming message and features in the database
MEP	In-Out

Operation Type	Synchronous
Operation Effect	Idempotent
Precondition	Only authorized users SHOULD be allowed to use ACSAirspaceConflictDetection Service
Input	GetAirspaceConflictRequest
Output	AirspaceConflictSuccessResponse
Effect	When no conflict is detected a success response is returned. When an airspace conflict is detected then a Fault is raised indicating which parts of the message conflicts with what part of a feature.
Faults	ACSAirspaceConflictDetection shall respond with a Fault if operation detects a conflict or any other errors.

Table 5-49. ACSAirspaceConflictDetection getAirspaceConflictByUUID Operation

Operation Name	getAirspaceConflictByUUID
Description	The getAirspaceConflictByUUID operation detects an airspace conflict between the incoming message and features in the database
MEP	In-Out
Operation Type	Synchronous
Operation Effect	Idempotent
Precondition	Only authorized users SHOULD be allowed to use ACSAirspaceConflictDetection Service
Input	GetAirspaceConflictByUUIDRequest
Output	AirspaceConflictSuccessResponse
Effect	When no conflict is detected a success response is returned. When an airspace conflict is detected then a Fault is raised indicating which parts of the message conflicts with what part of a feature.
Faults	ACSAirspaceConflictDetection shall respond with a Fault if operation detects a conflict or any other errors.

All of the above synchronous operations will follow the sequence diagram below:

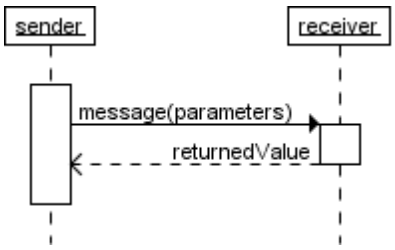

Figure 5-1. Synchronous Operations

All of the above synchronous operations will follow the sequence diagram below:

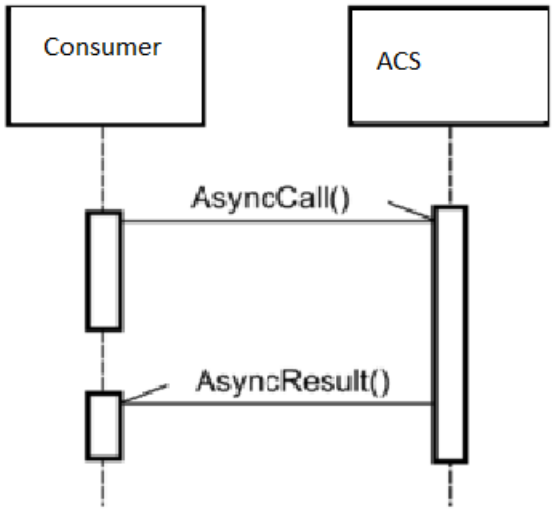

Figure 5-2. Asynchronous Operations

5.2.2 Messages

Table 5-50. Messages Belonging to ACSWMTS

Name	Definition	Direction	Data Objects/ Elements
GetCapabilitiesRequest	Used to retrieve capabilities of the service	In	GetCapabilities
GetCapabilitiesResponse	Responds to the request to get capabilities	Out	wmts:Capabilities or AnyContent
GetTileRequest	Allows user to retrieve a map tile	In	wmts:GetTile
GetTileResponse	Responds to the request to get map tile	Out	BinaryPayload, or TextPayload, or AnyContent
GetFeatureInfoRequest	Allows user to request to get the feature info	In	wmts:GetFeature Info
GetFeatureInfoResponse	Responds to the request to get the feature info	Out	wfs:FeatureCollection, or TextPayload, or AnyConten

Table 5-51. Messages Belonging to ACSWMS

Name	Definition	Direction	Data Objects/ Elements
GetCapabilitiesRequest	Allows user to retrieve capabilities	In	GetCapabilities
GetCapabilitiesResponse	Responds to the request to get capabilities	Out	WMS_Capabilities or AnyContent
GetMapRequest	Allows user to retrieve map	In	GetMap
GetMapResponse	Responds to the request to get map	Out	BinaryPayload, or TextPayload, or AnyContent
GetFeatureInfoRequest	Allows user to request to get the feature info	In	GetFeatureInfo
GetFeatureInfoResponse	Responds to the request to get the feature info	Out	wfs;FeatureCollection, or TextPayload, or AnyContent
GetLegendGraphicRequest	Allows user to request to get map legend graphic	In	GetLegendGraphic
GetLegendGraphicResponse	Responds to the request to get map legend graphic	Out	BinaryPayload or TextPayload, or AnyContent
DescribeLayerRequest	Allows user to request a description of layer(s)	In	DescribeLayer
DescribeLayerResponse	Responds to the request to describe layer(s)	Out	TextPayload, or AnyContent

Table 5-52. Messages Belonging to ACSWFS

Name	Definition	Direction	Data Objects/ Elements
GetCapabilitiesRequest	Allows user to retrieve capabilities	In	GetCapabilities
GetCapabilitiesResponse	Responds to the request to get capabilities	Out	WFS_Capabilities
GetFeatureRequest	Allows user to retrieve features.	In	GetFeature
GetFeatureResponse	Responds to the request to get features	Out	FeatureCollection
DescribeFeatureTypeRequest	Allows user to request to get the feature type	In	DescribeFeatureType
DescribeFeatureTypeResponse	Responds to the request to get the feature type	Out	DescribeFeatureTypeResponse
GetPropertyValueRequest	Allows user to request to get the property value	In	GetPropertyValue
GetPropertyValueRespo	Responds to the request	Out	ValueCollection

Name	Definition	Direction	Data Objects/ Elements
nse	to get the property value		
ListStoredQueriesRequest	Allows user to request to get the stored queries	In	ListStoredQueries
ListStoredQueriesResponse	Responds to the users request to get the stored queries	Out	ListStoredQueriesResponse
DescribeStoredQueriesRequest	Allows user to request a description of the stored queries	In	DescribeStoredQueries
DescribeStoredQueriesResponse	Responds to the users request to get the description of the stored queries	Out	DescribeStoredQueriesResponse
CreateStoredQueryRequest	Allows user to request for the system to store the query	In	CreateStoredQuery
CreateStoredQueryResponse	Responds to the users request to store the query	Out	CreateStoredQueryResponse
DropStoredQueryRequest	Allows user to request to drop a stored query	In	DropStoredQuery
DropStoredQueryResponse	Responds to the users request to drop the query	Out	DropStoredQueryResponse

Table 5-53. Messages Belonging to ACSPostOpMetrics

Name	Definition	Direction	Data Objects/Elements
CreateMetricDefinitionRequest	Allows user to create a new metrics definition.	In	definitionName, jasperReport
ListMetricDefinitionsRequest	Allows user to retrieve the list of metrics that can be retrieved.	Out	type
ListMetricDefinitionsResponse	Responds to the request to get the list of metrics.	In	definitionName,
ModifyMetricDefinitionRequest	Allows user to create a new metrics definition.	Out	definitionName, jasperReport
GetMetricDefinitionRequest	Allows user to retrieve the source for a metric definition report.	In	definitionName,
GetMetricDefinitionResponse	Returns the metric definition report source to the user.	Out	jasperReport
GetMetricResultsRequest	Allows user to retrieve the results for a specified metric.	In	name, type, format parameter

Name	Definition	Direction	Data Objects/Elements
GetMetricResultsResponse	Responds to the request to get a metric.	Out	TextPayload or BinaryPayload
DeleteMetricDefinitionRequest	Allows user to delete a user defined metric.	In	name
ListPreDefinedMetricDefinitionsRequest	Allows user to retrieve the list of pre-defined metrics.	Out	type
ListPreDefinedMetricDefinitionsResponse	Responds to the request to get the list of pre-defined metrics.	In	definitionName, requiredParams

Table 5-54. Messages Belonging to ACSGeodecticComputation

Name	Definition	Direction	Data Objects/Elements
ComputeInverseRequest	Allows user to compute inverse	In	geodetic1, geodetic2, spheriodCode
ComputeInverseResponse	Responds to the request to compute inverse	Out	geodeticForwardAzimuth, geodeticBackAzimuth, geodeticDistance
ComputeInverse3DRequest	Allows user to compute inverse 3D	In	geodetic1, geodetic2
ComputeInverse3DResponse	Responds to the request to compute inverse 3D	Out	deltaHeight, ellipsoidalDistance, markToMarkDistance, geodeticForwardAzimuth, geodeticBackAzimuth, geodeticXyz, geodeticEnu
ComputeForwardRequest	Allows user to compute forward	In	geodetic1, geodeticForwardAzimuth, geodeticDistance, spheriodCode
ComputeForwardResponse	Responds to the request to compute forward	Out	geodetic2
ComputeForward3DRequest	Allows user to compute forward 3D	In	geodetic1, ellipsoidHeight1, geodeticEnu, geodeticXyz, ellipsoidalData, markToMarkData
ComputeForward3DResponse	Responds to the request to compute forward 3D	Out	geodetic2LatLon, geodetic2Xyz, geodeticBackAzimuth, ellipsoidHeight2,

Name	Definition	Direction	Data Objects/Elements
			ellipsoidalDistance, markToMarkDistance, geodeticEnu, deltaHeight, geodeticForwardAzimuth
ComputeBearingBearingRequest	Allows user to compute bearing bearing	In	geodetic1, geodetic2, geodeticAzimuth13, geodeticAzimuth23, spheriodCode
ComputeBearingBearingResponse	Responds to the request to compute bearing bearing	Out	intersects, geodetic3
ComputeSegmentSegmentRequest	Allows user to compute segment segment	In	geodetic1, geodetic2, geodetic3 geodetic4, spheriodCode
ComputeSegmentSegmentResponse	Responds to the request to compute segment segment	Out	intersects, intersectOrder, geodetic5
ComputeSegmentDistanceRequest	Allows user to compute segment distance	In	geodetic1, geodetic2, distance13 spheriodCode
ComputeSegmentDistanceResponse	Responds to the request to compute segment distance	Out	isBeyond, geodetic3
ComputePointSegmentRequest	Allows user to compute point segment	In	geodetic1, geodetic2, geodetic3, spheriodCode
ComputePointSegmentResponse	Responds to the request to compute point segment	Out	distanceInterpretation, distance3
ComputeMagneticDeclinationRequest	Allows user to compute magnetic declination	In	geodetic1, date
ComputeMagneticDeclinationResponse	Responds to the request to compute magnetic declination	Out	declination

Table 5-55. Messages Belonging to ACSDataSubscription

Name	Definition	Direction	Data Objects/ Elements
SubscribeRequest	Allows user to request for a new subscription to AI	In	Subscribe

Name	Definition	Direction	Data Objects/ Elements
SubscribeResponse	Responds to the users request for a new subscription	Out	SubscribeResponse
RenewRequest	Allows user to request for an update to their subscription	In	Renew
RenewResponse	Responds to the users request to update an existing Repository subscription	Out	RenewResponse
UnsubscribeRequest	Allows user to request to delete an existing subscription	In	Unsubscribe
UnsubscribeResponse	Responds to users request to delete an existing subscription	Out	UnsubscribeResponse
CreatePullPointRequest	Allows user to request a PullPoint resource	In	CreatePullPoint
CreatePullPointResponse	Responds to users request to create a PullPoint resource	Out	CreatePullPointResponse
GetPullPointMessages Request	Allows user to get a PullPoint message	In	GetMessages
GetPullPointMessages Response	Responds to users request to get a PullPoint message	Out	GetMessages Response
DestroyPullPointRequest	Allows user to terminate a PullPoint resource	In	DestroyPullPoint
DestroyPullPointResponse	Responds to users request to terminate a PullPoint resource	Out	DestroyPullPointResponse
GetResourcePropertyRequest	Allows user to request NotificationProducer resource properties	In	GetResourceProperty
GetResourceProperty Response	Responds to users request with NotifcationProducer resource property settings	Out	GetResourcePropertyResponse

Table 5-56. Messages Belonging to ACSDataQuery

Name	Definition	Direction	Data Objects/ Elements
GetSAADefinitionByUUIDRequest	Allows user to request static SAA data by UUID. Airspace BASELINE time slices whose valid time period (start time/end time) overlap the given startTime/endTime will be returned. If startTime and endTime are null, the current date will be used as start/endTimes.	In	airspaceUUID, codespace, startTime, endTime

Name	Definition	Direction	Data Objects/ Elements
	Referenced features within the time slices are included in the result.		
GetSAADefinitionByUUIDResponse	Responds to the users request with static SAA data by UUID	Out	saaMessage
GetSAAScheduleByUUIDRequest	Allows user to query SAA schedule data by UUID. Airspace TEMPDELTA time slices whose valid time period (start time/end time) overlap the given startTime/endTime will be returned. If startTime and endTime are not provided, all TEMPDELTA time slices for the airspace are returned. Referenced features within the time slices are included in the result.	In	airspaceUUID, codespace, startTime, endTime, scheduleID, airspaceType, scheduleStatus
GetSAAScheduleByUUIDResponse	Responds to the users request with SAA schedule data by UUID	Out	saaMessage
GetIntegratedSAAByUUIDRequest	Allows user to query integrated SAA data by UUID. Airspace BASELINE and TEMPDELTA time slices whose valid time period (start time/end time) overlap the given startTime/endTime will be returned. If startTime and endTime are not provided, all BASELINE and TEMPDELTA time slices for the airspace are returned.	In	airspaceUUID, codespace, startTime, endTime, scheduleID, airspaceType, scheduleStatus
GetIntegratedSAAByUUIDResponse	Responds to the users request with integrated SAA data by UUID, which includes both SAA definition and schedule	Out	saaMessage
GetAIAlongFlightPathRequest	Allows users to identify AI features along a flight path. The Inputs are Start & End	In	airportId navaidId fixName designatorNumb

Name	Definition	Direction	Data Objects/ Elements
	Time , Min and Max Altitude, buffer distance, and Flight Path/Route (2 or more - ARPT ID, NAVAID ID, FIX ID or AIRWAY ID)		er designatorSecondLetter locationDesignator StartTime EndTime bufferDistance altUpperLimit altUpperLimitRef altLowerLimit altLowerLimitRef featureGroupName
GetAIAlongFlightPathResponse	The response includes AI data for the principal feature identified given the group name.	Out	ACSDataQueryGroupedResultType
GetAIWithinRadiusRequest	Allows users to identify AI features within requested radius. The Inputs are Start & End Time , Min and Max Altitude, buffer distance, and an ARPT ID or a NAVAID ID, or a FIX NAME required to identify a point for the radius.	In	airportId navaidId fixName StartTime EndTime bufferDistance altUpperLimit altUpperLimitRef altLowerLimit altLowerLimitRef featureGroupName
GetAIWithinRadiusResponse	The response includes AI data for the principal feature identified given the group name.	Out	ACSDataQueryGroupedResultType
GetAIForNotamEventRequest	Allows user to query NOTAMS using an Event identifier (Event UUID).	In	eventId
GetAIForNotamEventResponse	The response includes list of AI features updated as result of processing FNS NOTAM event.	Out	ACSDataQueryResultType
GetChartDataForCycleRequest	Allows users to query AI data for a specific feature within a Chart Cycle given a date. The Chart Cycle start and end date is idenfied using the date provided by the user.	In	cycleCurrentAtDate featureClassifier

Name	Definition	Direction	Data Objects/ Elements
GetChartDataForCycleResponse	The response includes AI data within the desired Chart Cycle for the requested feature.	Out	ACSDataQuery ResultType

Table 5-57. Messages Belonging to ACSAirspaceConflictDetection

Name	Description	Direction	Data Objects/ Elements
GetAirspaceConflictRequest	Allows user to detect airspace conflicts	In	aixm:AirspaceTimeSlice
GetAirspaceConflictByUUIDRequest	Allows user to detect airspace conflicts	In	airspaceUUID, codespace, gml:validTime, aixm: AirspaceActivation

5.2.3 Faults

Table 5-58. ACS Fault Messages

Error/Exception	Description	Data Objects/Elements	Applicable Service
ServiceExceptionReport	This will be the result of any improper entries/use for the ACS web service operations.	http://www.opengis.net/ogc:ServiceExceptionReport	ACSWMTS; ACSWMS; ACSWFS;
ResourceUnknownFault	The resource identified the message is not known to the web service	BaseFaultType	ACSDataSubscription
InvalidFilterFault	The subscribe message contained a filter that is not understood or supported by the NotificationProducer	BaseFaultType	ACSDataSubscription
TopicExpressionDialectUnknownFault	The subscribe message contained a TopicExpression filter having a dialect that is not understood or supported by the NotificationProducer	BaseFaultType	ACSDataSubscription
InvalidTopicExpressio	The subscribe message	BaseFaultType	ACSDataSubscripti

Error/Exception	Description	Data Objects/Elements	Applicable Service
nFault	contained a Topic Expression filter where the contents of the filter did not match the dialect specified		on
TopicNotSupportedFault	The subscribe message contained a TopicExpression filter that referenced a topic that is not supported by the notification producer	BaseFaultType	ACSDataSubscription
UnacceptableInitialTerminationTimeFault	The value of the InitialTerminationTime specified in the subscribe or renew message is not acceptable to the NotificationProducer	BaseFaultType	ACSDataSubscription
SubscribeCreationFailedFault	The subscribe request failed to process	BaseFaultType	ACSDataSubscription
UnableToDestroySubscriptionFault		BaseFaultType	ACSDataSubscription
UnableToCreatePullPointFault	Failure to create a PullPoint	BaseFaultType	ACSDataSubscription
UnableToGetMessagesFault	The PullPoint was unable to return messages for some reason	BaseFaultType	ACSDataSubscription
UnableToDestroyPullPointFault	The PullPoint was unable to destroy the PullPoint resource for some reason	BaseFaultType	ACSDataSubscription
ResourceUnavailableFault	Resource requested is not available	BaseFaultType	ACSDataSubscription
UnableToDestroySubscriptionFault	SubscriptionManager was nable to destroy the Subscription resource for some reason	BaseFaultType	ACSDataSubscription
Fault	This will be the result of any invalid message or any improper entries/use for the ACS web service operations.	FaultMsg	ACSPostOpMetrics; ACSGeodeticComputation; ACSAirspaceConflictDetection; ACSDataQuery;
GetAirspaceConflictResponseFault	This will be the result of an airspace conflict	GetAirspaceConflictResponseFaultM	ACSAirspaceConflictDetection

Error/Exception	Description	Data Objects/Elements	Applicable Service
		sg, aixm:Airspace, conflictReason, certain, conflictObject	

5.2.4 Data Elements

1. All data exchanged by ACS SHALL conform to the AIXM 5.1, Aeronautical Information Exchange Model, Date(for model creation), available at http://www.aixm.aero/gallery/content/public/AIXM51 along with a conceptual data model.
2. All data elements provided by ACS SHALL be valid, that is, conform to definitions, syntax, and constraints as defined in the XML schema found at the AIXM website.
3. Data elements are also specified in Tables below in accordance with FAA-STD-070 section.

Table 5-59. ACSAirspaceConflictDetection Service Data Elements

FDR ID	Name	Definition	Permissible Values	Unit of Measure	Datatype	Format	Obligation	Occurence
	FaultMsg	Description of the fault	N/A	N/A	String		Required	1
	GetAirspaceConflictResponsFaultMsg	Outer most container element for the Conflict information	N/A	N/A	Complex		Required	1
	aixm:Airspace[1]	Aixm airspace definition	N/A	N/A	Complex		Required	1
	conflictReason	Description of conflict			String		Required	1
	certain	If all 3.5 information is available, then true	True/false	N/A	Boolean		Required	1
	conflictObject	Provides object of conflict	Aixm:airspace[1], aixm:Route[1], aixm:VerticalStructure[1]	N/A	Complex		Required	1
	aixm:AirspaceTimeSlic	aixm object specifying 3.5D	N/A	N/A	Complex		Required	1

FDR ID	Name	Definition	Permissible Values	Unit of Measure	Datatype	Format	Obligation	Occurence
	e[1]							
	airspaceUUID	UUID	N/A	N/A	String		Required	1
	codespace	Codespace	N/A	N/A	String		Required	1
	gml:validTime	Valid time. This gml data element is defined in aixm-5.1/schema/ISO_19136_Schemas/temporal.xsd	N/A	N/A	Complex		Required	1
	aixm: AirspaceActivation[1]	aixm object specifying timesheets	N/A	N/A	Complex		Required	1

[1] This aixm data element is defined in AIXM_Features.xsd

Table 5-60. ACS Data Query Service Data Elements

FDR ID	Name	Definition	Permissible Values	Unit of Measure	Datatype	Format	Obligation	Occurence
	FaultMsg	Description of the fault	N/A	N/A	String		Required	1
	airspaceUUID,	Airspace identifier	N/A	N/A	String		Required	1
	codeSpace		N/A	N/A	String		Required	1
	startTime	start of time period	N/A	N/A	Datetime		Optional	1
	endTime	end of time period	N/A	N/A	Datetime		Optional	1
	scheduleID	schedule identifier	N/A	N/A	Integer		Optional	1
	airspace Type	Identified the type of airspace for which data is requestd	ATCAA, SUA, TFR, ALTRV, LAA, SAA_ Component		String		Optional	1
	schedule Status	identifies status of airspace for which data is requested	PENDING, APPROVE,		String		Optional	1

FDR ID	Name	Definition	Permissible Values	Unit of Measure	Datatype	Format	Obligation	Occurence
			DISAPPROVED, CANCELLED					
	saa:saaMessage	Response to all getSAA requests			Complex		Optional	1
	airportId	A coded designator for uniquely identifying an airport	N/A	N/A	String		N/A	many
	navaidId	A coded designator for uniquely identifying a Navaid.	N/A	N/A	String		Optional	many
	fixName	The full textual name of a fix (Designated Point)	N/A	N/A	String		Optional	many
	designatorNumber	The number of the route designator. It is one of the 3 required field needed for AirwayId	N/A	N/A	String		Optional (Required only for AirwayId)	many
	designatorSecondLetter	The letter of the route designator. It is one of the 3 required field needed for AirwayId	N/A	N/A	String		Optional (Required only for AirwayId)	many
	locationDesignator	A textual description of the area in which a designated route is situated. It is one of the 3 required field needed for AirwayId	N/A	N/A	String		Optional (Required only for AirwayId)	many
	bufferDistance	The distance from the stated point. Need to		NM, KM, M, FT, MI, CM	ValDistanceType		Required	1

FDR ID	Name	Definition	Permissible Values	Unit of Measure	Datatype	Format	Obligation	Occurence
		provide a Unit of Measurement (UOM) and also the value						
	altUpperLimit	The upper limit of the altitude. The UOM and the value must be provided.	N/A	FT, M, FL, SM	ValDistanceVerticalType		Required	1
	altUpperLimitRef	The vertical reference of upper limit of altitude	N/A	MSL SFC	CodeVerticalReferenceType		Required	1
	altLowerLimitRef	The vertical reference of the lower limit ot altitude	N/A	SFC MSL	CodeVerticalReferenceType		Required	1
	altLowerLimit	The lower limit of the altitude. The UOM and the value must be provided.	N/A	FT, M, FL, SM,	ValDistanceVerticalType		Required	1
	featureGroupName	The name of the feature group	N/A	AIRPORT, ARTCC, ASOS/AWOS, OBSTACLE, NAVAID, AIRSPACE, NOTAM	String		Required	1 to max 7
	designatorSecondLetter	The letter of the route designator. It is one of the 3 required field needed for AirwayId	N/A	N/A	String		Optional (Required only for AirwayId)	many
	locationDesignator	A textual description of the area in which a designated route is situated. It is one of the 3	N/A	N/A	String		Optional (Required only for AirwayId)	many

FDR ID	Name	Definition	Permissible Values	Unit of Measure	Datatype	Format	Obligation	Occurence
		required field needed for AirwayId						
	radius	The distance of the radius from the stated point. Need to provide a Unit of Measurement (UOM) and also the value		NM, KM, M, FT, MI, CM	ValDistanceType		Required	1
	featureGroupName	The name of the feature group	N/A	AIRPORT, ARTCC, ASOS/AWOS, OBSTACLE, NAVAID, AIRSPACE, NOTAM	String		Required	1 to max 7
	featureGroupName	The name of the feature group	N/A	AIRPORT, ARTCC, ASOS/AWOS, OBSTACLE, NAVAID, AIRSPACE, NOTAM	String		Required	1 to max 7
	ServiceExceptionReport	Description of the fault	N/A	N/A	String		N/A	1
	eventIdentifier	Event identifier	N/A	N/A	String		Required	1

Table 5-61. ACS Data Subscription Service Data Elements

FDR ID	Name	Definition	Permissible Values	Unit of Measure	Datatype	Format	Obligation	Occurence
	wsrf-bf: BaseFault	WSN Object containing fault	N/A	N/A	Complex		Required	1

FDR ID	Name	Definition	Permissible Values	Unit of Measure	Datatype	Format	Obligation	Occurrence
	Type	information						
	wsnt: Subscribe	WSN object used to create a subscription for notification	N/A	N/A	Complex		Required	1
	wsnt: Subscribe Response	WSN object used confirm if a create subscription was successful.	N/A	N/A	Complex		Required	1
	wsnt: Renew	WSN object used to update a subscription for notification	N/A	N/A	Complex		Required	1
	wsnt: Renew Response	WSN object Used confirm if a subscription update was successful	N/A	N/A	Complex		Required	1
	wsnt:Unsubscribe	WSN object Used to delete a subscription	N/A	N/A	Complex		Required	1
	wsnt:Unsubscribe Response	WSN object Used confirm if a subscription deletion was successful	N/A	N/A	Complex		Required	1
	wsnt:CreatePullPoint	WSN object Used create a PullPoint for accumulating messages	N/A	N/A	Complex		Required	1
	wsnt: CreatePullPoint Response	WSN object Used confirm if a pull point creation was successful	N/A	N/A	Complex		Required	1
	wsnt: Destroy PullPoint	WSN object Used to destroy an existing PullPoint	N/A	N/A	Complex		Required	1
	wsnt: Destroy PullPoint Response	WSN object Used confirm if a PullPoint destruction was successful.	N/A	N/A	Complex		Required	1
	wsnt: GetMessages	WSN object Used to retrieve accumulated notification	N/A	N/A	Complex		Required	1

FDR ID	Name	Definition	Permissible Values	Unit of Measure	Datatype	Format	Obligation	Occurence
		messages from a PullPoint. Identifies PullPoint from which to retrieve accumulated messages and the maximum number of messages to retrieve. If maximum number is omitted, all messages held by the PullPoint are returned						
	wsnt: GetMessages Response	WSN object Used to return a accumulated messages held on a PullPoint	N/A	N/A	Complex		Required	1
	wsrf-rp: Get Resource Property	WSN object Used to retrieve a single resource property value of Notification Producer resource properties. QName of a NotificationProducer resource property element for which the value is being requested	N/A	N/A	Complex		Required	1
	wsrf-rp:GetResource Property Response	WSN object Used to return the value of the resource property. Returns the resource property value that corresponds to the QName in	N/A	N/A	Complex		Required	1

FDR ID	Name	Definition	Permissible Values	Unit of Measure	Datatype	Format	Obligation	Occurence
		the GetResourceProperty request						

Table 5-62. ACSGeodeticComputation Service Data Elements

FDR ID	Name	Definition	Permissible Values	Unit of Measure	Datatype	Format	Obligation	Occurrence
	FaultMsg	Description of fault	N/A	N/A	String	N/A	Required	1
	aixm:date[5]	The date for computing the magnetic declination	N/A	N/A	Complex	N/A	Required	1
	declination	The angle on the horizontal plane between the magnetic north and the true north at a particular location	N/A	N/A	Double	N/A	Required	1
	ComputeInverse3DResponse.aixm:deltaHeight[1]	The difference between ellipsoidHeight2 and ellipsoidHeight1	N/A	N/A	Complex	N/A	Required	1
	ComputeForward3DResponse.aixm:deltaHeight[1]	The difference between ellipsoidHeight2 and ellipsoidHeight1	N/A	N/A	Complex	N/A	Optional	1
	aixm:distance13[1]	The distance between point 1 and point 3	N/A	N/A	Complex	N/A	Required	1
	aixm:distance3[1]	The shortest distance between point three and the line from point 1 to point 2	N/A	N/A	Complex	N/A	Required	1
	aixm:distanceInterpretation	Enumeration of SEGMENT_ALONG_PERPENDICULAR_LINE, STATION_1, STATION_2	N/A	N/A	Complex	N/A	Required	1
	ComputeIn	The ellipsoidal	N/A	N/A	Complex	N/A	Required	1

FDR ID	Name	Definition	Permissible Values	Unit of Measure	Datatype	Format	Obligation	Occurrence
	verse3DResponse.aixm:ellipsoidalDistance[1]	distance between two points						
	ComputeForward3DResponse.aixm:ellipsoidalDistance[1]	The ellipsoidal distance between two points	N/A	N/A	Complex	N/A	Optional	1
	ellipsoidalData	Contains deltaHeight[1], geodeticForwardAzimuth, and elipsoidalDistance[1]. These data elements are described in this table, too.	N/A	N/A	Complex	N/A	Required[6]	1
	aixm:ellipsoidHeight2[1]	The second point ellipsoid height	N/A	N/A	Complex	N/A	Required	1
	geodetic1[2]	Coordinates of the first point	N/A	N/A	Complex	N/A	Required	1
	geodetic2[2]	Coordinates of the second point	N/A	N/A	Complex	N/A	Required	1
	geodetic2LatLon[4]	Coordinates of the second point	N/A	N/A	Complex	N/A	Required	1
	geodetic2Xyz	XYZ coordinates	N/A	N/A	Complex	N/A	Required	1
	geodetic3[4]	Coordinates of the third point	N/A	N/A	Complex	N/A	Required	1
	geodetic4[4]	Coordinates of the fourth point	N/A	N/A	Complex	N/A	Required	1
	geodetic5[4]	Coordinates of the fourth point	N/A	N/A	Complex	N/A	Required	1
	geodeticAzimuth13	Azimuth from point 1 to point 3	N/A	N/A	Complex	N/A	Required	1
	geodeticAzimuth23	Azimuth from point 2 to point 3	N/A	N/A	Complex	N/A	Required	1
	geodeticBackAzimuth	Back azimuth from North	N/A	N/A	Complex	N/A	Required	1
	geodeticDistance[1]	Distance between two points	N/A	N/A	Complex	N/A	Required	1
	geodeticEn	Differential	N/A	N/A	Complex	N/A	Required[6]	1

FDR ID	Name	Definition	Permissible Values	Unit of Measure	Datatype	Format	Obligation	Occurrence
	u	East, North, Up						
	geodeticForwardAzimuth	Forward azimuth from North	N/A	N/A	Complex	N/A	Required	1
	geodeticXyz	XYZ coordinates	N/A	N/A	Complex	N/A	Required[6]	1
	intersectOrder	The order of the intersection, i.e. 1234, 1243, 2134, 2143	N/A	N/A	Integer	N/A	Required	1
	intersects	Enumeration of YES, NO, INFINITE	N/A	N/A	Complex	N/A	Required	1
	isBeyond	Whether point 3 is beyond point 2, i.e. distance between 1 and 3 is greater than distance between 1 and 2	N/A	N/A	Boolean	N/A	Required	1
	markToMarkData	Contains deltaHeight[1], geodeticForwardAzimuth, and markToMarkDistance[1]. These data elements are described in this table, too.	N/A	N/A	Complex	N/A	Required[6]	1
	markToMarkDistance[1]	Distance between two points	N/A	N/A	Complex	N/A	Required	1
	spheriodCode	Spheroid code 1 AIRY 2 BESSEL 3 CLARKE 1858 4 CLARKE 1866 5 CLARKE 1880 6 EVEREST 7 FISCHER 8 INTERNATIONAL 9 GRS80	N/A	N/A	Integer	N/A	Required	1

[1] The data element is of type “ValDistanceType” which is defined in AIXM_DataTypes.xsd
[2] ComputeInverse3DRequest and ComputeForward3DRequest use the data element Location[3]. All other data elements are of type Coordinate[4]

[3] The data element is of type “Location” which consists of latLon[4] and an xyz point
[4] The data element is of type “Coordinate” which contains mandatory latitude/longitude pairs and one optional ellipsoidHeight*
[5] The data element is of type “DateType” which is defined in AIXM_DataTypes.xsd
[6] For ComputeForward3dRequest there is a choice of geodeticEnu, geodeticXyz, ellipsoidalData, markToMarkData. So exactly one of these data elements has to be provided.

Table 5-63. ACSPostOpMetrics Service Data Elements

FDR ID	Name	Definition	Permissible Values	Unit of Measure	Datatype	Format	Obligation	Occurence
	FaultMsg	Description of the fault	N/A	N/A	String	N/A	Required	1
	CreateMetricDefinitionRequest	Used to create a metrics definition report on the server.	N/A	N/A	Complex	N/A	Required	1
	CreateMetricDefinitionRequest.definitionName	Name of the new metric definition	N/A	N/A	String	N/A	Required	1
	CreateMetricDefinitionRequest.jasperReport	JasperReport as JRXML file	N/A	N/A	String	N/A	Required	1
	ListMetricDefinitionsRequest	Used to list metric definitions available on the server	N/A	N/A	Complex	N/A	Required	1
	ListMetricDefinitionsRequest.type	Used to specify the type of metrics	predetermined, user, all	N/A	String	N/A	Required	1
	ListMetricDefinitionsResponse	Returns the names of metrics definitions and their type (predetermined, user).	N/A	N/A	Complex	N/A	Required	1
	ListMetricDefinitionsResponse.definitionName	names of metrics definitions and their type	N/A	N/A	Complex	N/A	Optional	0 to many

FDR ID	Name	Definition	Permissible Values	Unit of Measure	Datatype	Format	Obligation	Occurence
	ModifyMetricDefinitionRequest	Used to modify a metrics definition report on the server.	N/A	N/A	Complex	N/A	Required	1
	ModifyMetricDefinitionRequest.definitionName	Name of the new metric definition	N/A	N/A	String	N/A	Required	1
	ModifyMetricDefinitionRequest.jasperReport	JasperReport as JRXML file	N/A	N/A	String	N/A	Required	1
	GetMetricDefinitionRequest	Used to retrieve the source of a metric definition	N/A	N/A	Complex	N/A	Required	1
	ModifyMetricDefinitionRequest.definitionName	Name of the new metric definition for which the source should be returned	N/A	N/A	String	N/A	Required	1
	GetMetricDefinitionResponse	Used to return the source of a metric definition	N/A	N/A	Complex	N/A	Required	1
	GetMetricDefinitionResponse.jasperReport	JasperReport as JRXML file	N/A	N/A	String		Required	1
	GetMetricResultsRequest	Used to retrieve the result of a metric.	N/A	N/A	Complex	N/A	Required	1
	GetMetricResultsRequest.type	Metric type	predetermined, user, all	N/A	String	N/A	Required	1
	GetMetricResultsRequest.name	Metric definition name	N/A	N/A	String	N/A	Required	1
	GetMetricResultsResponse.format	format of the response	xml, pdf, html, xls, xlsx, rtf,	N/A	String	N/A	Required	1

FDR ID	Name	Definition	Permissible Values	Unit of Measure	Datatype	Format	Obligation	Occurence
			csv, docx, odt, ods, jrprint,					
	GetMetricResultsRequest.parameter	Used to specify metric report parameter(query params)	N/A	N/A	Complex	N/A	Optional	0 to many
	GetMetricResultsResponse		acs:TextPayload acs:BinaryPayload	N/A	Complex	N/A	Required	1
	DeleteMetricDefinitionRequest	Used to delete a metric definition	N/A	N/A	Complex	N/A	Required	1
	DeleteMetricDefinitionRequest.definitionName	Name of the new metric definition	N/A	N/A	String	N/A	Required	1
	ListPreDefinedMetricDefinitionsRequest	Used to list predefined metric definitions available on the server	N/A	N/A	Complex	N/A	Required	1
	ListPreDefinedMetricDefinitionsResponse	Returns the names of predefined metrics definitions and their required parameters	N/A	N/A	Complex	N/A	Required	1
	ListPreDefinedMetricDefinitionsResponse.defaultReports	names of default metrics definitions and required params	N/A	N/A	Complex	N/A	Required	0 to many

Table 5-64. ACS WFS Service Data Elements

FDR	Name	Definition	Permissible Values	Unit of Measure	Datatype	Format	Obligation	Occurrence
	ows: ExceptionReport	Error message containing the reason why service call is unsuccessful	N/A	N/A	Complex		Required	1
	wfs:Get_Capabilities	OWS object to request WFS capabilities.	N/A	N/A	Complex		Required	1
	wfs:WFS_Capabilities	WFS object. Contains WFS capabilities in a XML format	N/A	N/A	Complex		Required	1
	wfs:GetFeature	WFS object. Used to get AI Feature using WFS	N/A	N/A	Complex		Required	1
	wfs:FeatureCollection	WFS object. Contains AI information in XML format (AIXM 5.1).	N/A	N/A	Complex		Required	1
	wfs:DescribeFeatureType	WFS object. Used to gather a description of the Feature type	N/A	N/A	Complex		Required	1
	wfs-util:DescribeFeatureTypeResponse	WFS object. Contains Feature type information	N/A	N/A	Complex		Required	1

FDR	Name	Definition	Permissible Values	Unit of Measure	Datatype	Format	Obligation	Occurrence
	wfs:GetPropertyValue	WFS object. Used to get a property value for a specific attribute	N/A	N/A	Complex		Required	1
	wfs:ValueCollection	WFS object. Property value information for specified attribute if present in data	N/A	N/A	Complex		Required	1
	wfs:ListStoredQueries	WFS object. Used to list all of the stored queries in WFS	N/A	N/A	Complex		Required	1
	wfs:ListStoredQueriesResponse	WFS object. All stored queries in WFS	N/A	N/A	Complex		Required	1
	wfs:DescribeStoredQueries	WFS object. Used to gather the descriptions of the stored queries in WFS	N/A	N/A	Complex		Required	1
	wfs:DescribeStoredQueriesResponse	WFS object. Returns stored query descriptions	N/A	N/A	Complex		Required	1
	wfs:CreateStoredQueries	WFS object. Used to create a stored query	N/A	N/A	Complex		Required	1

FDR	Name	Definition	Permissible Values	Unit of Measure	Datatype	Format	Obligation	Occurrence
		in WFS						
	wfs:CreateStoredQueriesResponse	WFS object. Indicates stored query successfully created	N/A	N/A	Complex		Required	1
	wfs:DropStoredQueries	WFS object. Used to delete a stored query in WFS	N/A	N/A	Complex		Required	1
	wfs:DropStoredQueriesResponse	WFS object. Indicates stored query successfully deleted	N/A	N/A	Complex		Required	1

Table 5-65. ACSWMS Service Data Elements

FDR	Name	Definition	Permissible Values	Unit of Measure	Datatype	Format	Obligation	Occurrence
	ogc:ServiceExceptionReport	Contains error message and is defined by http://www.opengis.net/ogc/exceptions_1_3_0.xsd	N/A	N/A	Complex		Required	1
	GetCapabilities	Outer most element of the GetCapabilities	N/A	N/A	Complex		Required	1

FDR	Name	Definition	Permissible Values	Unit of Measure	Datatype	Format	Obligation	Occurrence
		request						
	GetCapabilities.version	Service version	1.0.0, 1.1.0, 1.1.1, 1.3, 1.3.0	N/A	String		Required	1
	GetCapabilities.namespace	limits response to layers in a given namespace	N/A	N/A	String		Optional	1
	GetMap	Outer most element of the GetMap request	N/A	N/A	Complex		Required	1
	GetMap.sld:StyledLayerDescriptor	StyledLayerDescriptor XML which controls or enhances map layers and styling. Defined in http://www.opengeospatial.org/standards/sld	N/A	N/A	Complex		Required	1
	GetMap.CRS	Spatial Reference System for map output. Value is in form EPSG:nnn.	N/A	N/A	String		Required	1
	GetMap.BBox	Bounding box for map extent. Value is minx,miny,maxx,maxy in units of the SRS.	N/A	N/A	Complex		Required	1
	GetMap.Output.Size.Wi	Width of map output, in pixels.		N/A	String		Required	1

FDR	Name	Definition	Permissible Values	Unit of Measure	Datatype	Format	Obligation	Occurrence
	dth							
	GetMap.Output.Size.Height	Height of map output, in pixels.		N/A	String		Required	1
	GetMap.Output.Format	Format for the map output. See WMS output formats for supported values.	application/json;type-utfgrid, application/openlayers, application/pdf, image/geotiff, image/geotiff8, image/gif, image/jpeg, image/png, image/png8, image/tiff, image/tiff8, image/vnd.jpeg-png, kml, kmz, rss	N/A	String		Required	1
	GetMap.Output.Transparent	Whether the map background should be transparent. Values are true or false. Default	true/false	N/A	Boolean		Optional	1

FDR	Name	Definition	Permissible Values	Unit of Measure	Datatype	Format	Obligation	Occurrence
		is false						
	GetMap.Output.BgColor	Background color for the map image. Value is in the form RRGGBB. Default is FFFFFF (white).	N/A	N/A	String		Optional	1
	GetMap.Exceptions	Format in which to report exceptions. Default value is XML	XML, INIMAGE, BLANK	N/A	String		Optional	1
	GetMap.Time	Time value or range for map data. The format used for specifying a time in the WMS TIME parameter is based on ISO-8601. Times follow the		N/A	DateTime	general format: yyyy-MM-ddThh:mm:ss.SSSZ where: yyyy: 4-digit year •MM: 2-digit month •dd: 2-digit day •hh: 2-digit hour •mm: 2-digit minute •ss: 2-digit second •SSS: 3-digit millisec	Optional	1

FDR	Name	Definition	Permissible Values	Unit of Measure	Datatype	Format	Obligation	Occurrence
						ond		
	GetMap.Elevation	Elevation or range for map data		N/A	Complex		Optional	1
	GetMap.CqlFilter	Defines filters for the getMap request. The cql_filter parameter is similar to the standard filter parameter, but the filter is expressed using ECQL (Extended Common Query Language). ECQL provides a more compact and readable syntax compared to OGC XML filters. For full details see the ECQL Reference and CQL and ECQL tutorial.	N/A	N/A	String		Optional	1
	GetMap.MsgUOMConversion.ElevationUom	Unit of measure for elevation	MAMSL, FAMSL, FAGL, STDPR, FL	N/A	String		Optional	1
	GetMap.MessageUOMConversionBearingUom	Unit of measure for north indicator	TR, MN		String		Optional	1
	GetMap.Tiled	Meta-tiling prevents issues with duplicated labels when using a tiled	True/false		Boolean		Optional	1

FDR	Name	Definition	Permissible Values	Unit of Measure	Datatype	Format	Obligation	Occurrence
		client such as OpenLayers. When meta-tiling is used, images are rendered and then split into smaller tiles (by default in a 3x3 pattern) before being served. In order for meta-tiling to work, the tile size must be set to 256x256 pixels, and the tiled and tilesorigin parameters must be specified. The tiled parameter controls whether meta-tiling is used.						
	GetMap.TilesOrigin	The tilesorigin parameter is also required for meta-tiling. TilesOrigin is specified using 2 floats, x and y, where x and y are the coordinates of the lower left corner (the "origin") of the tile grid system.			list containing 2 floats		Optional	1
	GetLegendGraphic	Outer most element of the GetLegendGrap			Complex		Required	1

FDR	Name	Definition	Permissible Values	Unit of Measure	Datatype	Format	Obligation	Occurrence
		hic request						
	GetLegendGraphic.Layer	Layer for which to produce legend graphic.			String		Required	1
	GetLegendGraphic.Style	Style of layer for which to produce legend graphic. If not present, the default style is selected. The style may be any valid style available for a layer, including non-SLD internally-defined styles.			String		Optional	1
	GetLegendGraphic..Format	This gives the MIME type of the file format in which to return the legend graphic. Allowed values are the same as for the FORMAT= parameter of the WMS GetMap request.	application/json;type-utfgrid, application/openlayers, application/pdf, image/geotiff, image/geotiff8, image/gif, image/jpeg, image/png, image/png8, image/tiff, image/tiff8, image/vnd		String		Required	1

FDR	Name	Definition	Permissible Values	Unit of Measure	Datatype	Format	Obligation	Occurrence
			.jpeg-png, kml, kmz, rss					
	GetLegendGraphic.Size.Width	This gives a hint for the width of the returned graphic in pixels. Vector-graphics can use this value as a hint for the level of detail to include.			Integer		Optional	1
	GetLegendGraphic..Size.Height	This gives a hint for the height of the returned graphic in pixels.			Integer		Optional	1
	GetLegendGraphic.FeatureType	Feature type for which to produce the legend graphic. This is not needed if the layer has only a single feature type.			Complex		Optional	1
	GetLegendGraphic.Exceptions	Format in which to report exceptions. Default value is XML	XML, INIMAGE, BLANK		String		Optional	1
	GetLegendGraphic.Rule	Rule of style to produce legend graphic for, if applicable. In the case that a style has multiple rules but no specific rule is selected, then the map			String		Optional	1

FDR	Name	Definition	Permissible Values	Unit of Measure	Datatype	Format	Obligation	Occurrence
		server is obligated to produce a graphic that is representative of all of the rules of the style.						
	GetLegendGraphic.Scale	In the case that a RULE is not specified for a style, this parameter may assist the server in selecting a more appropriate representative graphic by eliminating internal rules that are out-of-scope. This value is a standardized scale denominator, defined in Section 10.2 of Symbology Encoding: http://www.opengeospatial.org/standards/se			String		Optional	1
	GetLegendGraphic.sld: StyledLayerDescriptor	This parameter allows an SLD document to be included directly. Defined in http://www.opengeospatial.org/standards/sld			String		Optional	1

FDR	Name	Definition	Permissible Values	Unit of Measure	Datatype	Format	Obligation	Occurrence
	GetLegendGraphic.LegendOptions	GeoServer allows finer control over the legend appearance via the vendor parameter LEGEND_OPTIONS.			String		Optional	1
	GetLegendGraphic.LegendOptions.fontName	the name of the font to be used when generating rule titles. The font must be available on the server			String		Optional	1
	GetLegendGraphic.LegndOptions.fontStyle	can be set to italic or bold to control the text style. Other combination are not allowed right now but we could implement that as well.			String		Optional	1
	GetLegendGraphic.LegendOptions.fontSize	allows us to set the Font size for the various text elements. Notice that default size is 12.			Integer		Optional	1
	GetLegendGraphic.LegendOptions.fontColor	allows us to set the color for the text of rules and labels (see above for recommendation on how to create values). Values are expressed in 0xRRGGBB format			hexBinary		Optional	1

FDR	Name	Definition	Permissible Values	Unit of Measure	Datatype	Format	Obligation	Occurrence
	GetLegendGraphic.LegindOption.fontAliasing	when true enables antialiasing for rule titles	true/false		Boolean		Optional	1
	GetLegendGraphic.LegendOptions.bgColor	background color for the generated legend, values are expressed in 0xRRGGBB format			hexBinary		Optional	1
	GetLegendGraphic.LegendOptions.dpi	sets the DPI for the current request, in the same way as it is supported by GetMap. Setting a DPI larger than 91 (the default) makes all fonts, symbols and line widths grow without changing the current scale, making it possible to get a high resolution version of the legend suitable for inclusion in printouts			Integer		Optional	1
	GetLegendGraphic.LegindOption.forceLabels	"on" means labels will always be drawn, even if only one rule is available. "off" means labels will never be drawn, even if multiple rules are available. Off by default.	on/off		String		Optional	1

FDR	Name	Definition	Permissible Values	Unit of Measure	Datatype	Format	Obligation	Occurrence
	GetFeatureInfo	Outermost element of the GetFeatureInfo request					Required	1
	GetFeatureInfo.GetMap	Refer to GetMap request			Complex		Required	1
	GetFeatureInfo.QueryLayers	list of one or more layers to query.			Complex		Required	1
	GetFeatureInfo.QueryLayersLayer	layer name to query			String		Required	1
	GetFeatureInfo.IFormat	Format for the feature information response. Default format is text/plain	text/plain, application/vnd.ogc.gml, application/vnd.ogc.gml/3.1.1, text/html, application/json, text/javascript		String		Optional	1
	GetFeatureInfo.FeatureCount	Maximum number of features to return. Default is 1.			Integer		Optional	1
	GetFeatureInfo.I	X ordinate of query point on map, in pixels. 0 is left side. i is the parameter key used in WMS 1.3.0.			Integer		Required	1
	GetFeatureInfo.J	Y ordinate of query point on map, in pixels. 0			Integer		Required	1

FDR	Name	Definition	Permissible Values	Unit of Measure	Datatype	Format	Obligation	Occurrence
		is the top. j is the parameter key used in WMS 1.3.0.						
	GetFeatureInfo.Exceptions	Format in which to report exceptions. The default value XML	XML, INIMAGE, BLANK		String		Optional	1
	DescribeLayer	Outermost element of the DescribeLayer request					Required	1
	DescribeLayer.Layers	List of layers to describe			Complex		Required	1
	DescribeLayer.Layers.Layer	layer to describe			String		Required	1
	DescribeLayer.Exceptions	Refer to GetMap request	XML, INIMAGE, BLANK		String		Optional	1
	DescribeLayer.Format	application/vnd.ogc.wms_xml, application/json, text/javascript, text/xml			String		Optional	1
	wms:WMS_Capabilities	Outer most element of the response to a GetCapabilites request and is defined in http://www.opengis.net/wms/capabilities_1_3_0.xsd	N/A	N/A	Complex		Required	1

FDR	Name	Definition	Permissible Values	Unit of Measure	Datatype	Format	Obligation	Occurrence
	wfs:FeatureCollection	Outermost element of the response to a GetFeatureInfo request and is defined in wfs:FeatureCollection		N/A	Complex		Choice	1
	acs_payload:BinaryPayload	Payload containing binary data			Complex			1
	acs_payload:BinaryPayload.ows:MimeType	MIMEType format of the PayloadContent once base64 decodified.			String		Required	1
	acs_payload:BinaryPayload.BinaryContent	Binary content encoded in base64. It could be useful to enclose it in a CDATA element to avoid XML parsing.			base64Binary		Required	1
	acs_payload:TextPayload	This allows to include any text like HTML, TXT, etc			Complex			1
	acs_payload:TextPayload.ows:MimeType	MIMEType format of the TextContent			String		Required	1
	acs_payload:TextPayload.TextContent	Text string like HTML, XHTML, XML or TXT. HTML and TXT data . to be enclosed in a CDATA element to avoid XML parsing.			String		Required	1
	acs_payload:AnyConte	This allows to include any			String		Required	1

FDR	Name	Definition	Permissible Values	Unit of Measure	Datatype	Format	Obligation	Occurrence
	nt	XML content that it is not any of the previous ones.						

Table 5-66. ACSWMTS Service Data Elements

FDR	Name	Definition	Permissible Values	Unit of Measure	Datatype	Format	Obligation	Occurrence
	ows: ExceptionReport	Contains error message message and is defined by http://www.opengis.net/ows/owsExceptionReport.xsd	N/A	N/A	Complex		Required	1
	wmts:GetTile	Outer most element of the GetTile request	N/A	N/A	Complex		Required	1
	wmts:GetTile.Layer	A layer identifier has to be referenced. Specifies layer for which tile is to be displayed			String		Required	1
	wmts.GetTile.Style	A style identifier has to be referenced. Specifies the style in which to display the tile			String		Required	1
	wmts:GetTile.Format	Output Format of the tile			String	<pattern value="(application|audio|image|text|video|	Required	1

FDR	Name	Definition	Permissible Values	Unit of Measure	Datatype	Format	Obligation	Occurrence
						message|multipart|model)/.+(;\s*.+=.+)*"/>		
	wmts:GetTile.DimensionNameValue	Dimension and name value			Complex		Optional	Unbounded
	wmts:GetTile.DimensionNameValue.name	Dimension name			String		Requried	1
	wmts:GetTile.TileMatrixSet	A TileMatrixSet identifier has to be referenced			String		Required	1
	wmts:GetTile.TileMatrix	A TileMatrix identifier has to be referenced			String		Required	1
	wmts:GetTile.TileRow	Row index of tile matrix			Integer		Required	1
	wmts:GetTile.TileCol	Column index of tile matrix			Integer		Required	1
	wmts:GetFeatureInfo	Outermost element of the GetFeatureInfo request and is defined in wmts:GetFeatureInfo			Complex		Required	1
	wmts:GetFeatureInfo.wmts:GetTile	Refer to wmts:GetTile			Complex		Required Required	1
	wmts:GetFeatureInfo.J	Row index of a pixel in the tile			Integer		Required	1
	wmts:GetF	Colum index of			Integer		Required	1

FDR	Name	Definition	Permissible Values	Unit of Measure	Datatype	Format	Obligation	Occurrence
	eatureInfo.I	a pixel in the tile						
	wmts:GetFeatureInfo.InfoFormat	Output MIME type format of the retrieved information			String	<pattern value="(application|audio|image|text|video|message|multipart|model)/.+(;\s*.+=.+)*"/>	Required	1
	wfs:FeatureCollection	Outermost element of the response to a GetFeatureInfo request and is defined in wfs:FeatureCollection		N/A	Complex		Choice	1
	wmts:Capabilities	Outer most element of the response to a GetCapabilites request and is defined in http://www.opengis.net/wmts/wmtsGetCapabilites_Response.xsd	N/A	N/A	Complex		Required	1
	acs_payload:BinaryPayload	Payload containing binary data			Complex		Choice	1
	acs_payload:BinaryPa	MIMEType format of the			String		Required	1

FDR	Name	Definition	Permissible Values	Unit of Measure	Datatype	Format	Obligation	Occurrence
	yload.ows:MimeType	PayloadContent once base64 decodified.						
	acs_payload:BinaryPayload.BinaryContent	Binary content encoded in base64. It could be useful to enclose it in a CDATA element to avoid XML parsing.			base64Binary		Required	1
	acs_payload:TextPayload	This allows to include any text like HTML, TXT, etc			Complex		Choice	1
	acs_payload:TextPayload.ows:MimeType	MIMEType format of the TextContent			String		Required	1
	acs_payload:TextPayload.TextContent	Text string like HTML, XHTML, XML or TXT. HTML and TXT data . to be enclosed in a CDATA element to avoid XML parsing.			String		Required	1
	acs_payload:AnyContent	This allows to include any XML content that it is not any of the previous ones.			String		Choice	1

5.3 Machine-Processable Service Description Document

1. The ACS SHALL present an externalized machine-processable service description document, hereinafter called "WSDL" file, which defines and describes its interfaces and invocation bindings.
2. The WSDL files SHALL comply with the Web Services Description Language (WSDL) Version 2.0/1.1 Part 1: Core Language, W3C, 26 June 2007.
3. The WSDL file SHALL be prepared by the developer during the ACS design stage in compliance with requirements specified in sections 5.1.2 and all subsections of this WSRD. The requirements specified in the WSRD were derived from the web service requirements stated in the ACS SRS document.

6 Non-Functional Requirements

6.1 Quality of Service Requirements

ACS Data Service shall meet the requirements below for quality of service requirements.
Note: The following Non-Functional Requirements do not apply to the ACS Business Service(s)

[AIMMS2Req-122, SSD-134, T, R2] The system shall return the results for a WFS query with up to 1000 returned features that are queried on a single attribute which is indexed in the database, in 10 seconds or less.

> [AIMMS2Req-3376, AIMMS2Req-122, T, R2] The ACS WFS Service shall return the results for a WFS query of up to 1000 features that are queried on a single attribute which is indexed in the database, within 10 seconds.

[AIMMS2Req-123, SSD-135, T, R2] The system shall respond to airspace conflict detection requests for a single airspace in 10 seconds or less.

> [AIMMS2Req-3377, AIMMS2Req-123, T, R3] The ACS Airspace Conflict Detection Service shall respond to airspace conflict detection requests for a single airspace within 10 seconds.

[AIMMS2Req-126, SSD-139, T, R2] The system shall provide notification to all subscribers of the notification service that an update has occurred within one minute.

> [AIMMS2Req-3379, AIMMS2Req-126, T, R2] The ACS Subscription Service shall provide notifications, within one minute, to all its subscribers when an update has occurred.

[AIMMS2Req-127, SSD-140, D, R2] The system shall allow a minimum of 100 concurrent ACS consumers.

> [AIMMS2Req-3380, AIMMS2Req-127, D, R2] The AI Service Engine shall support a minimum of 100 concurrent consumers.

[AIMMS2Req-129, SSD-142, D, R2] The system shall maintain subscription services with at least 3,000 users.

> [AIMMS2Req-3381, AIMMS2Req-129, D, R2] The ACS Subscription Service shall have the capability to support subscription and notifications for 3,000 users.

[AIMMS2Req-125, SSD-137, T, R2] The system shall meet an end-to-end, one-way message latency within a 500 millisecond time range.

> *Note: This time does not include any additional latency introduced by the network, cloud, FAA security infrastructure, or other factors external to the ACS or AIMM. The message to be tested will consist of a simple query (e.g. based on a UUID) for a single AIXM feature element.*

> [AIMMS2Req-3378, AIMMS2Req-125, T, R2] AI Service Engine shall meet an end-to-end one-way message latency within a 500 millisecond time range. This latency is measured within the ACS System and will not include any other factors external to the ACS System.

Table 6-1. Quality of Service Parameters

QoS Characteristic Name	Definition	Calculation Method	Unit of Measure	Required Value
Availability	Probability that the service is present or ready for immediate use	100 * ((24 – Total Outage Time) / 24). Measurements are taken daily and apply to the preceding 24-hour period.	Percentage accurate to 1 decimal place.	99.9
Capacity	Number of service requests that the service can accommodate within a time period(This will be determined later).	Simple count.	Whole positive number, per period of time	3000 concurrent users

QoS Characteristic Name	Definition	Calculation Method	Unit of Measure	Required Value
Response Time	Maximum time required to complete a service request	Measured from the time the service provider receives the request to the time the service provider transmits the response.	Milliseconds	500 Milliseconds

ACS SHALL meet the required values shown for the quality of service (QoS) characteristics listed in **Table 6-1**.

6.2 Security Requirements

1. ACS SHALL comply with "NIST Special Publication 800-95, Guide to Secure Web Services, National Institute of Standards and Technology, August 2007.
2. To support message-level security, ACS SHALL deploy the WS-Security 1.1 family of specifications as defined in Web Services Security: SOAP Message Security 1.1 (WS-Security 2004), OASIS Standard Specification, 1 February 2006.
3. The system MUST comply with the Information Security standards as specified in the NAS TV-1.
    a. TV-1 consists of the systems standards rules that govern and sometimes constrain the choices that can be made in the design, implementation, and operation of an architecture. The technical standards generally govern what hardware and software may be implemented and what system data formats may be used.
    b. TV-2 contains expected changes in technology-related standards and conventions that appear in TV-1. It contains predictions about the availability of emerging standards, and delineates the standards that will potentially impact the relevant system elements.
4. The system MUST comply with all Information System Security directives, orders and policies within NAS EA Technical View-1, Standards.
5. The system MUST provide security service capabilities in accordance with FAA Order 1370.82, Information Systems Security Program.
6. The system MUST be compliant with FIPS-200, Federal Information Processing Standard Publication 200, Minimum Security Requirements for Federal Information and Information Systems.
7. The system services MUST be compliant with the requirements defined in the SWIM Interoperability Basic Security Profile.
8. The system MUST comply with 44 United States Code (USC) Federal Information Security Management Act (FISMA).

6.2.1 Authentication

1. Service consumer Username/Password at the transport level
2. The system MUST use the IAM Directory Service, described in the IAM RFP Requirements document, for authentication of systems.
3. Password complexity and change management will be enforced.
4. ACS must use the NEMS password for all ACS WS-C.

6.2.2 Authorization

1. ACS SHALL use the credentials received as part of the authentication process for future determinations of whether or not a service consumer is authorized to invoke an operation it may request.
2. ACS SHALL deploy access control for implementing authorization.
3. Access Control SHALL be implemented in accordance with FAA Access Control Policies.
4. ACS SHALL define multiple roles Subscriber, Query Read and Write, and Administrator.

6.2.3 Integrity

1. ACS uses WS-Security (see section 6.2 requirement 3 of this document), the integrity requirements are being addressed (the data is checked for possible corruption through other systems within AIMM).
2. ACS SHALL maintain data at an integrity level of 1x10-5.

6.2.4 Confidentiality

1. The system MUST restrict the release of NAS data to authorized users and implement confidentiality/access clearance in accordance with NAS-SR-1000, section 3.10.3.4.

6.2.5 Non-Repudiation

1. ACS SHALL provide security service capabilities in accordance with FAA Order 1370.104, Digital Signature Policy.

6.2.6 Audit Capability

1. ACS SHALL incorporate an auditing capability within the system to provide the following functions:

1.1 The system MUST log system activity data (Secuirty.log).
1.2 The system MUST log AI Mapping data.
1.3 The system MUST log AI Mapping activity.
1.4 The system MUST log all error messages.
1.5 The system MUST log all AI Storage Activities.
1.6 The system MUST record auditing information on database maintenance functions taken. (Oracle audit trace dump (Adump directory). Oracle will flag events like multiple failed login attempts etc.,)
1.7 The system MUST archive the log information for a minimum of 3 years.
1.8 The system MUST provide the capability to retrieve and sort archived log information by, at a minimum: time, date, UUID, and entry type.

1.9 The system MUST time stamp events for use in audit record generation.

6.2.7 Other Security Requirements

There are currently no other security requirements

7 Implementation Requirements

7.1 Binding Requirements

7.1.1 ACSWMS Binding Protocol

ACS SHALL deploy the protocols described in sections 7.1.1.1 through 7.1.1.4 for the binding to the interfaces.

7.1.1.1 ACSWMS Data Protocol

For data serialization, ACS SHALL use Extensible Markup Language (XML) 1.1, W3C, November 2008, http://www.w3.org/tr/2008/REC-xml-20081126/.

7.1.1.2 ACSWMS Message Protocol

All messages exchanged by ACS SHALL be constructed in accordance with SOAP Version 1.2 Part 1: Messaging Framework, W3C Recommendation, 27 April 2007, http://www.w3.org/TR/soap12-part1/

7.1.1.3 ACSWMS Transport Protocol

ACS SHALL use Hypertext Transport Protocol –HTTP/1.1, (https://tools.ietf.org/html/rfc7230) as a transport-level protocol.

7.1.1.4 ACSWMS Other Protocols

No other protocols identified at this time.

7.1.2 ACSPostOpMetrics Binding Protocol

ACS SHALL deploy the protocols described in sections 7.1.1.1 through 7.1.1.4 for the binding to the interfaces.

7.1.2.1 ACSPostOpMetrics Data Protocol

For data serialization, ACS SHALL use Extensible Markup Language (XML) 1.1, W3C, November 2008, http://www.w3.org/tr/2008/REC-xml-20081126/.

7.1.2.2 ACSPostOpMetrics Message Protocol

All messages exchanged by ACS SHALL be constructed in accordance with SOAP Version 1.2 Part 1: Messaging Framework, W3C Recommendation, 27 April 2007, http://www.w3.org/TR/soap12-part1/

7.1.2.3 ACSPostOpMetrics Transport Protocol

ACS SHALL use Hypertext Transport Protocol –HTTP/1.1, (https://tools.ietf.org/html/rfc7230) as a transport-level protocol.

7.1.2.4 ACSPostOpMetrics Other Protocols

No other protocols identified at this time.

7.1.3 ACSGeodeticComputation Binding Protocol

ACS SHALL deploy the protocols described in sections 7.1.1.1 through 7.1.1.4 for the binding to the interfaces.

7.1.3.1 ACSGeodeticComputation Data Protocol

For data serialization, ACS SHALL use Extensible Markup Language (XML) 1.1, W3C, November 2008, http://www.w3.org/tr/2008/REC-xml-20081126/.

7.1.3.2 ACSGeodeticComputation Message Protocol

All messages exchanged by ACS SHALL be constructed in accordance with SOAP Version 1.2 Part 1: Messaging Framework, W3C Recommendation, 27 April 2007, http://www.w3.org/TR/soap12-part1/

7.1.3.3 ACSGeodeticComputation Transport Protocol

ACS SHALL use Hypertext Transport Protocol –HTTP/1.1, (https://tools.ietf.org/html/rfc7230) as a transport-level protocol.

7.1.3.4 ACSGeodeticComputation Other Protocols

No other protocols identified at this time.

7.1.4 ACSAirspaceConflictDetection Binding Protocol

ACS SHALL deploy the protocols described in sections 7.1.1.1 through 7.1.1.4 for the binding to the interfaces.

7.1.4.1 ACSAirspaceConflictDetection Data Protocol

For data serialization, ACS SHALL use Extensible Markup Language (XML) 1.1, W3C, November 2008, http://www.w3.org/tr/2008/REC-xml-20081126/.

7.1.4.2 ACSAirspaceConflictDetection Message Protocol

All messages exchanged by ACS SHALL be constructed in accordance with SOAP Version 1.2 Part 1: Messaging Framework, W3C Recommendation, 27 April 2007, http://www.w3.org/TR/soap12-part1/

7.1.4.3 ACSAirspaceConflictDetection Transport Protocol

ACS SHALL use Java Message Service (JMS) 1.0, as a transport protocol, http://www.w3.org/TR/soapjms/

7.1.4.4 ACSAirspaceConflictDetection Other Protocols

No other protocols identified at this time.

7.1.5 ACSWFS Binding Protocol

ACS SHALL deploy the protocols described in sections 7.1.1.1 through 7.1.1.4 for the binding to the interfaces.

7.1.5.1 ACSWFS Data Protocol

For data serialization, ACS SHALL use Extensible Markup Language (XML) 1.1, W3C, November 2008, http://www.w3.org/tr/2008/REC-xml-20081126/.

7.1.5.2 ACSWFS Message Protocol

All messages exchanged by ACS SHALL be constructed in accordance with SOAP Version 1.2 Part 1: Messaging Framework, W3C Recommendation, 27 April 2007, http://www.w3.org/TR/soap12-part1/

7.1.5.3 ACSWFS Transport Protocol

ACS SHALL use Hypertext Transport Protocol –HTTP/1.1, (https://tools.ietf.org/html/rfc7230) as a transport-level protocol.

7.1.5.4 ACSWFS Other Protocols

No other protocols identified at this time.

7.1.6 ACSDataQuery Binding Protocol

ACS SHALL deploy the protocols described in sections 7.1.1.1 through 7.1.1.4 for the binding to the interfaces.

7.1.6.1 ACSDataQuery Data Protocol

For data serialization, ACS SHALL use Extensible Markup Language (XML) 1.1, W3C, November 2008, http://www.w3.org/tr/2008/REC-xml-20081126/.

7.1.6.2 ACSDataQuery Message Protocol

All messages exchanged by ACS SHALL be constructed in accordance with SOAP Version 1.2 Part 1: Messaging Framework, W3C Recommendation, 27 April 2007, http://www.w3.org/TR/soap12-part1/

7.1.6.3 ACSDataQuery Transport Protocol

ACS SHALL use Hypertext Transport Protocol –HTTP/1.1, (https://tools.ietf.org/html/rfc7230) as a transport-level protocol.

7.1.6.4 ACSDataQuery Other Protocols

No other protocols identified at this time.

7.1.7 ACSDataSubscription Binding Protocol

ACS SHALL deploy the protocols described in sections 7.1.1.1 through 7.1.1.4 for the binding to the interfaces.

7.1.7.1 ACSDataSubscription Data Protocol

For data serialization, ACS SHALL use Extensible Markup Language (XML) 1.1, W3C, November 2008, http://www.w3.org/tr/2008/REC-xml-20081126/.

7.1.7.2 ACSDataSubscription Message Protocol

All messages exchanged by ACS SHALL be constructed in accordance with SOAP Version 1.2 Part 1: Messaging Framework, W3C Recommendation, 27 April 2007, http://www.w3.org/TR/soap12-part1/

7.1.7.3 ACSDataSubscription Transport Protocol

ACS SHALL use Hypertext Transport Protocol –HTTP/1.1, (https://tools.ietf.org/html/rfc7230) as a transport-level protocol.

7.1.7.4 ACSDataSubscription Other Protocols

No other protocols identified at this time.

7.2 Processing Requirements

1. Any system errors (excluding those associated with fault messages) generated by ACS SHALL be logged to aid in resolving the problem.

7.3 Operational Environment Requirements

1. ACS SHALL be able to be used over the FAA Telecommunications Infrastructure (FTI).
2. ACS SHALL be able to be used over the public internet.
3. ACS SHALL be able to connect to sub-systems via SWIM connected infrastructure.
4. ACS SHALL support 24 hours a day, 7 days a week operations.
5. ACS SHALL allow continuous monitoring during operational use without disruption or any detectable degradation of normal service operations.
6. *Note: The WSRD document does not impose any hardware compliance requirements.

8 Quality Assurance Provisions

The ACS service shall be tested in compliance with the development of the Release 3 ACS requirements. The testing will be conducted both by Northrop Grumman and the FAA. Upon completion of tests, the ACS will be determined sufficient. The process will be as follows:

1. Initial Testing will be conducted by Northrop Grumman to ensure everything is working properly.
2. The ACS Service will be sent to system test environment for FAT testing.
3. If any errors are found PTRs will be created in our IBM Rational PTR Database.
4. To Address PTR's reference the AIMM Contractor Master Test Plan (CMTP) CDRL T01. This document will have the steps to thoroughly test to make sure the PTR is addressed.
5. FAA will conduct testing on the OT environments to ensure everything is in working order and meets the entire requirement pertaining to that service.

8.1 Responsibility for Verification

The FAA is responsible for developing and implementing the verification of requirements for each project. The FAA may delegate verification activities to other organizations, independent contractors, and/or the prime contractor.

8.2 Special Verification Requirements

There are no special verification requirements at the moment.

8.3 Verification Requirements Traceability Matrix

Refer to the AIMM System Subsystem Specification (SSS) Volume II VRTM v3.7 CDRL E02.